Vol. 10, No. 7

JULY, 1955

AGRICULTURAL CHEMICALS

In This Issue:

Home Garden Aerosols • Iron Chelates • NPFI Convention
Codling Moth Control • F-P Mixtures • Superphosphates in
Manure • Critics Of TVA Fertilizer Role • Pacific ESA Meets

they got me, pal...

them **FLY FLAKES**

is moider!

kill 'em fast...and easy! FLY FLAKES kill flies in minutes · kill resistant strains · kill maggots · are economical to use · for dairy barns, feed rooms, poultry houses, manure piles, outside areas. Available in 1 lb. cans; 2, 5 and 10 lb. bags, and 25 lb. drums.

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Insecticides Division
One Park Ave., N. Y. · Little Rock, Ark. · Baltimore 3, Md.

FLY FLAKES is a trademark.

Giant Servant of Agriculture

Experience is an arch to build upon—

The National Plant Food Institute begins operation this month with an abundance of experience to guide it in service to agriculture and the fertilizer industry.

P.C.A.
The SALT of the EARTH
RED MURIATE

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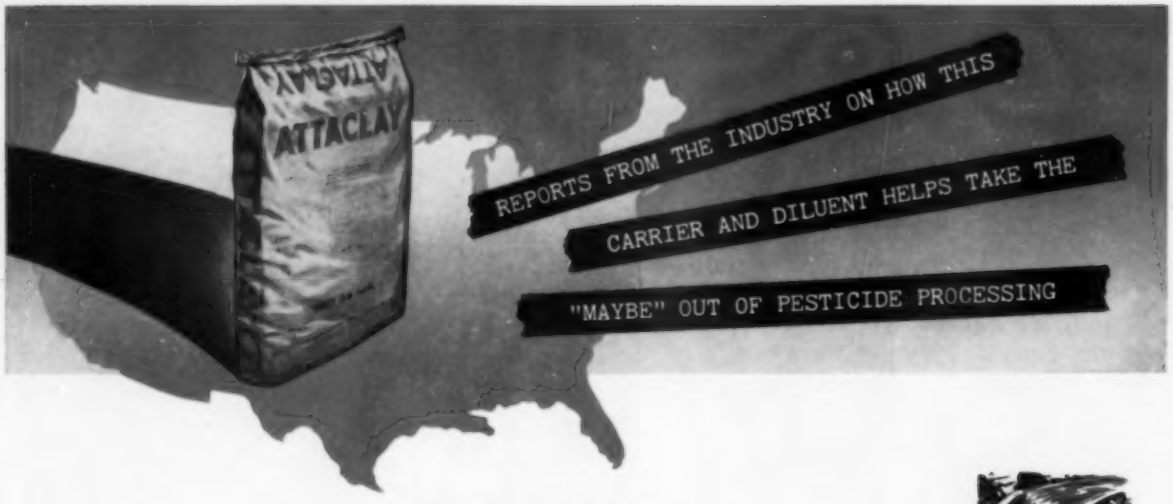

These plants cash in on Attaclay's over-all flexibility and efficiency

LOCATION: Pacific Northwest

PLANT MANAGER: *We make many products, yet inventory only one carrier and diluent—Attaclay. It does so many jobs so well that advantages show up all along the line—from simplified procurement to better finished products.*

LOCATION: South Central U. S.

PRODUCTION SUPERINTENDENT: *There was a time we used several diluents in addition to Attaclay. Then adverse weather left us with a heavy inventory of non-Attaclay DDT and BHC bases that caked on storage, all of which had to be re-worked. This unhappy experience sold us on using Attaclay across the board.*

LOCATION: Mississippi

PLANT MANAGER: *We've standardized on Attaclay for bases and finished dusts. And take my word for it, we have fewer problems in material scheduling and handling—less chance of errors occurring in formulating.*

LOCATION: Pennsylvania

MANAGER: *While our research division insists upon Attaclay for many of our products, we in the manufacturing end of the operation are convinced we can save money by using Attaclay in all dust bases and wettable powders.*

Soil Pesticide Grades

Attapulgus Clay is available in granular grades for the formulation of soil pesticides. Write for samples and data sheet.

Make Attaclay *your* unified source of greater profits and better products. We'll be glad to work with you.

ATTAPULGUS PRODUCTS *from*

MINERALS & CHEMICALS CORPORATION OF AMERICA

DEPT. P, 210 W. WASHINGTON SQUARE, PHILADELPHIA 5, PA.

AGRICULTURAL CHEMICALS

This Month's Cover

J. A. Howell (left), Virginia Carolina Chemical Corp., was named president of the National Plant Food Institute, while E. A. Geoghegan (right), Southern Cotton Oil Co., is chairman of the board of directors. See story, page 36.

JULY 1955

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A Monthly Magazine For the Trade

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Subscription Rates: *One year, United States,* $3.00; *Canada and Pan American countries,* $4.00; *Foreign,* $9.00. *Published monthly on the 1st by Industry Publications, Inc. Publication office,* 123 *Market Place, Baltimore* 2, *Md. Advertising and editorial office P. O. Box* 31, *Caldwell, New Jersey—Chicago Office,* 333 *N. Michigan Blvd., Advertising rates made known on application. Closing date for copy—5th of the month preceding month of issue.*

Entered as second-class matter November 4, 1949, at the Post Office at Baltimore, Md., under the Act of March 3, 1879.

Concentrated LIQUID Fertilizer

Progressive Formulator of Sullivan, Ill., Makes and Sells It with Monsanto Phosphoric Acid.

The flow of phosphoric acid is gauged from the storage tank into a stainless steel vat where the liquid fertilizer is being blended.

Potash nutrient pours into the anhydrous ammonia-urea-phosphoric acid mix in the vat. Phosphoric acid used is completely soluble—made from Monsanto 99.9% pure electric furnace elemental phosphorus.

Concentrated liquid fertilizer is pumped through a ¾" heavy-duty rubber hose into a tank truck. Truck is completely filled in approximately 30 minutes with enough fertilizer for a full day's spray schedule.

Formulator enters cab to drive to first spray job. Parked nearby are fertilizer spray rigs which can be custom-fitted to a wide variety of fertilizing jobs. Some are the products of the inventiveness of the local farmers.

Truck begins spraying concentrated liquid fertilizer on the field. Formulator's entire operation is fast, simple and requires only one man.

Spray rig features simple design, adjustable boom and rapid-delivery nozzles. Pump delivers fertilizer from tank with equal pressure at all nozzles.

Photographs courtesy Alyward Fertilizer Company

Monsanto Concentrated Liquid Fertilizer Nutrients

Diammonium Phosphate	(21.0-53.8-00.0)
Monoammonium Phosphate	(12.2-61.6-00.0)
75% Phosphoric Acid	(00.0-54.5-00.0)
Dipotassium Phosphate	(00.0-39.9-53.0)
Monopotassium Phosphate	(00.0-51.6-34.2)

They're highly concentrated—cost you less to store and handle. They're pure—give you extremely close control of formulation. And—your supply is assured by Monsanto, world's largest producer of elemental phosphorus. Write now for "Concentrated Water Soluble Fertilizers" to MONSANTO CHEMICAL COMPANY, Inorganic Chemicals Division, 710 North Twelfth St., St. Louis 1, Missouri.

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DOES IT LACK the bright, brilliant come-hither appearance which, thousands upon thousands of times, could draw the attention of prospective buyers to your brand name and to the merits of your product?

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Let us send you *proof* of our ability to transform the "wallflower" type of shipping sack into a go-getter of sales. Still better, call in the Raymond man!

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Middletown, Ohio. Phone 2-5461

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MULTIWALL PAPER SHIPPING SACKS

It pays you, the dealer and the farmer to concentrate on the premium

CASH IN ON THE SWING WITH THESE QUALITY

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High grade, low chloride *International Sulfate of Potash* can help you build a profitable volume of business on the premium fertilizers made for crops adversely affected by excess chlorides. Your farm customers will get improved quality and increased yields on high value crops such as tobacco, potatoes, vegetables, tree fruit and small fruit when they use fertilizers made with sulfate of potash. This quality plant food material is soluble, well conditioned and can be used without changing your present mixing processes.

At Carlsbad, New Mexico, *International* mines and refines these fine quality plant food materials for fertilizer manufacturers:

Sul-Po-Mag–Double Sulfate of Potash-Magnesia–22% K_2O–18% MgO
Sulfate of Potash–50% K_2O Minimum Muriate of Potash–60% K_2O Minimum
Muriate of Potash – Granular – 60% K_2O Minimum

International Minerals & Chemicals

potash division

fertilizer grades needed for profitable production of many crops.

TO PREMIUM FERTILIZERS POTASH MATERIALS

Sul·Po·Mag

Sul-Po-Mag enables you to produce premium grade fertilizers with a properly balanced combination of *two* essential plant foods: *sulfate of magnesium* and *sulfate of potash*. Both are water-soluble and readily available to growing crops.

Agricultural experiment station studies show that the soils in many crop-growing areas are critically low or deficient in available magnesium. In fact, this nutrient is so important to profitable crop production, it's often called *the fourth element in the fertilizer bag*.

Sul-Po-Mag has been advertised consistently in farm papers for many years. You'll find a welcome market for premium grades containing *Sul-Po-Mag* for use on soils that are deficient in magnesium and potash. For many farmers know from experience it helps them increase crop production, increase quality and increase profits.

When you use *Sul-Po-Mag* in the bag, identify it on the bag . . . N-P-K-Mg tells farmers that yours is a premium fertilizer.

PUT IT IN THE BAG

PUT IT ON THE BAG

INTERNATIONAL MINERALS & CHEMICAL CORPORATION
General Offices: 20 North Wacker Drive, Chicago 6

(Photo — Courtesy Soil Conservation Service, U. S. D. A.)

High Grade Muriate of Potash

by DUVAL

Duval Muriate of Potash ranks high as one of the essential nutrients which greatly increase yield and profits in crop production.

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Modern Plant and Refinery at Carlsbad, New Mexico

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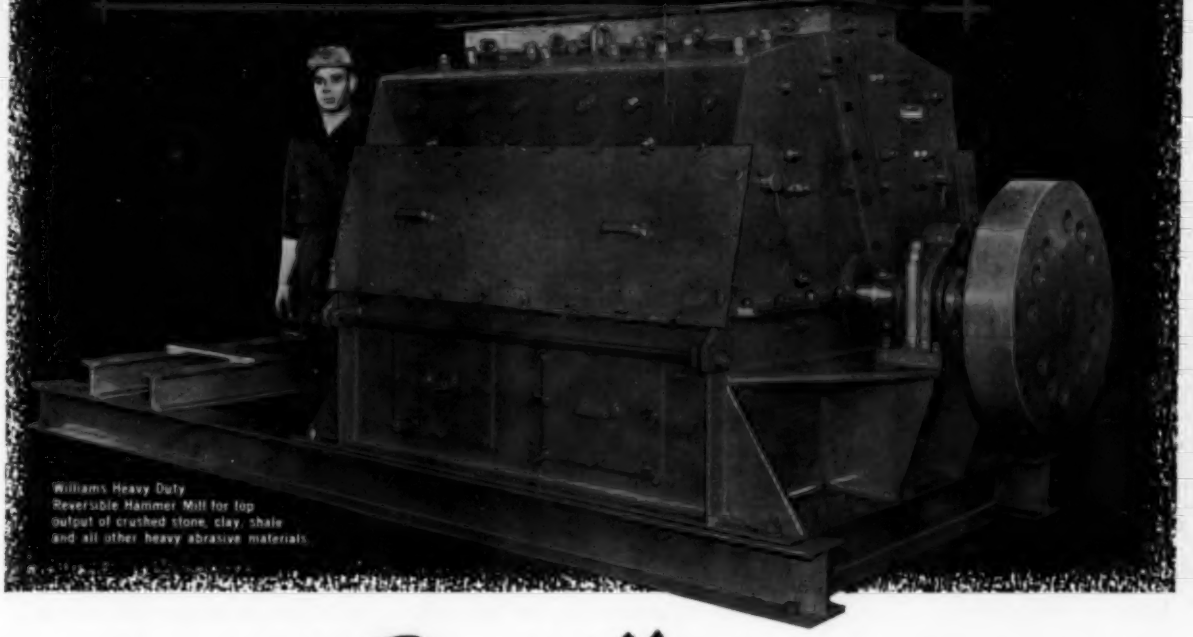
These Crushing Machines Give Double Service!



Williams Heavy Duty Reversible Hammer Mill for top output of crushed stone, clay, shale and all other heavy abrasive materials.

WILLIAMS *Reversible* HAMMER MILLS

Double service from hammers, breaker plates and grate bars—maintenance reduced to half or less—downtime cut as much as 50%—these are only a few of the money-making, time-saving features of Williams Reversible Hammer Mills.

Operation either clockwise or counter-clockwise with a reversible motor promises that hammers and other internal parts will work twice as long without even opening the machine. Slower and more even wear results in continuous peak output of a uniformly high quality product while, at the same time, demanding the very minimum of time and expense in the replacement of worn parts.

Reversible manganese breaker plates also give twice the usual length of service, and are adjustable to compensate for hammer wear to maintain original close settings.

For the most in real operating economy, high production and top quality products, get the facts about Williams Reversible Hammer Mills. *Write For Catalog.*

Open view of Reversible Hammer Mill. Note heavy shock-proof, wear-resistant manganese steel liners and breaker plates, and the rugged, reinforced construction. Entire interior easily, quickly accessible. Rotor removable without disturbing feeder or feed chute.

WILLIAMS PATENT CRUSHER & PULVERIZER CO.
2707 N. Broadway St. Louis 6, Mo.

WILLIAMS
CRUSHERS GRINDERS SHREDDERS

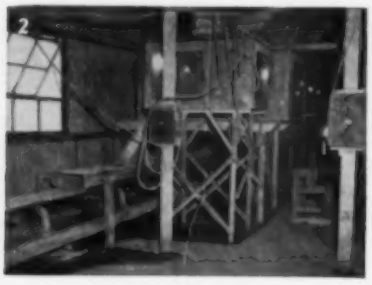
Impactors Helix-Seal Mills Roller Mills Air Separators Vibrating Screens Feeders

OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

How Spencer Helped Ark-Mo Cut 12-12-12 Formula Costs 16%

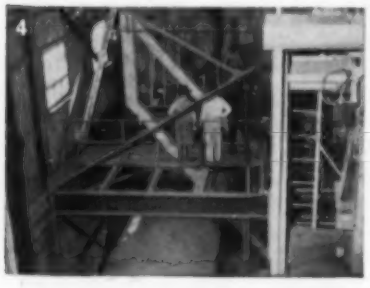
New granulation process developed jointly by Spencer and Ark-Mo lowers costs on 12-12-12 and other high nitrogen grades:

The big secret is accurate control throughout the process. At this panel the flow of various ingredients is recorded together with temperatures at various locations in the system.



Raw materials are weighed separately by these Omega Gravametric Feeders. Conveyor belt and elevator carries materials to screens and crushers where oversized are ground to pass 10-mesh.

The liquids are added in this ammoniator-granulator, only equipment of special design in the new Ark-Mo plant. All nitrogen is derived from SPENSOL solutions, in nearly all grades.



From the ammoniator the material flows to the dryer (foreground). Then it goes to the cooler and finished product screens. Fines are collected and weighed back into system.

In this machine the high nitrogen grades are coated with diatomaceous earth on way to storage. Low nitrogen grades go direct from cooler to storage by conveyor belt.

Another example of how Spencer looks after its customers' profits:

With today's competition it's even more vital to keep your formula costs low. To develop cost-cutting information for our SPENSOL customers, we joined with the Ark-Mo Plant Food Company, Walnut Ridge, Ark., to design a new plant where latest granulation information could be put into practice on a commercial scale. The result was a substantial decrease in the formula costs of high nitrogen fertilizers. For more information, write: Technical Service Staff, Spencer Chemical Co., 601 Dwight Bldg., Kansas City 5, Missouri.

SPENCER

SPENCER CHEMICAL COMPANY, Dwight Bldg., Kansas City 5, Mo. District Sales Offices: Atlanta, Ga.; Chicago, Ill.; Memphis, Tenn.; Works: Pittsburg, Kans.; Henderson, Ky.; Chicago, Ill.; Vicksburg, Miss.; Orange, Texas.

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Custom-Formulated MINERAL MIXTURES

MAKES IT *Easy* TO MAKE

Mineralized FERTILIZER

With *Tennessee's Custom-Formulated Mineral Mixtures* there is only one ingredient to add to your regular fertilizer to have a completely balanced plant food. No additional labor or mixing facilities. We custom-mix any combination of minerals to your own specifications. *Tennessee's Custom-Formulated Mineral Mixtures* come to your plant in bulk or bag already carefully mixed in controlled amounts of soluble, readily available forms of Copper, Manganese, Iron, Zinc, Magnesium and Boron. You cut down on raw material cost, number of items purchased and handling time with *Tennessee's Custom-Formulated Mineral Mixtures.*

Samples, specifications and detailed information upon request —

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Knock out plant pests economically with

prentox pyronyl

Dust Concentrate

these are the facts:

1. Now, high concentrate of pyrethrum sold on *economical* basis!
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3. Now, basic truck crop and home garden insecticide available at new low cost through addition of synergist to pyrethrum!
4. Fast killing action of pyrethrum – *free from toxological hazards!*

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PRENTISS pest-tested products you can count on:

DDT CONCENTRATES • CHLORDANE CONCENTRATES
WARFARIN • ROTENONE • SABADILLA • TOXAPHENE
LINDANE • PYRETHRUM PRODUCTS

Send today for technical literature on this NEW, fast-acting, economical PRENTOX PYRONYL DUST CONCENTRATE.

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RAYMOND
ROLLER MILL WITH WHIZZER

Specially equipped for
SULPHUR GRINDING

THE Raymond Roller Mill with Whizzer Separator has become standard equipment throughout the industry for pulverizing sulphur and sulphur-bearing insecticides.

The slow speed of the mill and the large air passages through the separating chamber help to prevent the sulphur from overheating or sticking. Special ball bearing journals, designed for sulphur grinding, are used for the rolls, and the entire system is blanketed with inert CO_2 gas.

Heavy gauge welded steel piping, pressure relief vents, and special facilities for discharging the product, reduce air leakage to a minimum and provide a safe, clean, automatic dustless operation.

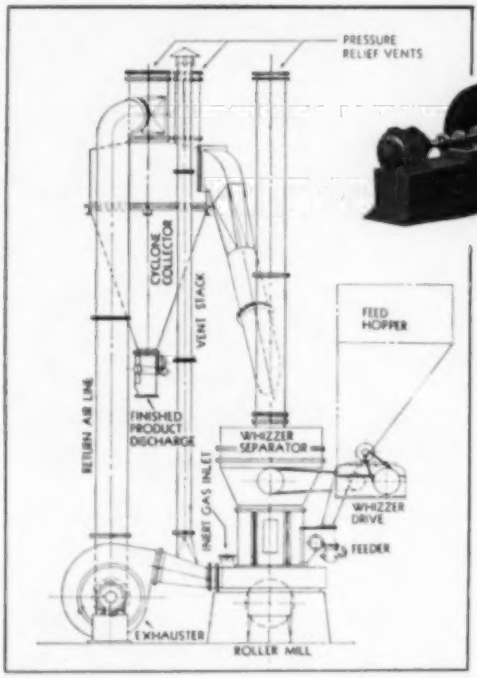
Raymond Roller Mills are equally efficient for handling other insecticide formulations and many similar materials.

Flow Diagram

Showing location of the pressure relief vents, the inert gas inlet and product discharge valve.

The Whizzer Separator is built integral with the mill, and is driven by an independent motor through a variable speed transmission.

Fineness control is available over a wide range by one simple adjustment while the mill is in operation.



Write for latest Raymond Bulletin No. 68

COMBUSTION ENGINEERING, INC.
Raymond Division

1311 NORTH BRANCH ST.
CHICAGO 22, ILLINOIS

SALES OFFICES IN PRINCIPAL CITIES

RIGHT NOW is the time to take the kinks out of your production plans for the new fertilizer year. ARCADIAN® Nitrana® and Urana® Nitrogen Solutions have many properties that make greater efficiency in a fertilizer blending and mixing plant.

In addition, these ARCADIAN Nitrogen Solutions help make your cured fertilizers the top-condition products that sell your service to American farmers.

Take full advantage of the values of ARCADIAN Nitrana and Urana Nitrogen Solutions in ammoniation, granulation and conditioning of your fertilizer products. Call on Nitrogen Division Technical Service for experienced help – their service is available to customers without charge.

NITROGEN DIVISION Allied Chemical & Dye Corporation

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Columbia 1, S. C. • Atlanta 3, Ga. • San Francisco 3, Cal. • Los Angeles 15, Cal.

NITROGEN DIVISION ALLIED CHEMICAL

From cake to clothing

Anhydrous Ammonia, one of Atlantic's many petrochemicals, may have an important part in producing the food you eat, the clothing you wear, dozens of things you depend on for better living. That's why you see the miniature oil refinery in the illustration.

This new member of Atlantic's chemical family has a variety of uses. On the farm, for instance, Anhydrous Ammonia is released into the soil where it supplies vital plant food to increase crop yields. Its use in the manufacture of synthetic fibers means new and better fabrics for clothing of all kinds.

Manufacturers rely heavily on ammonia for the making of hundreds of products . . . nitric acid in one plant, explosives in another, plastics in a third. Anhydrous Ammonia is only one of the many chemicals, produced by The Atlantic Refining Company, for which industry of all kinds is constantly finding new uses.

Atlantic sales engineers will be glad to work with your technical personnel to help improve quality, reduce costs, or develop new products. Write for information; just ask us how Atlantic petrochemicals can be helpful to you. The Atlantic Refining Company, Dept. J-7, 260 South Broad Street, Philadelphia 1, Pa.

ATLANTIC
PETROLEUM
CHEMICALS

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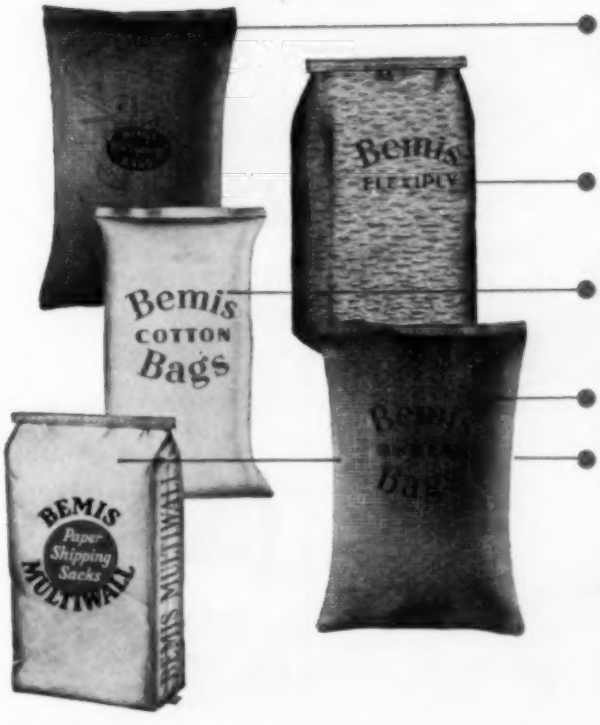
In Canada:
Naugatuck Chemicals Division of Dominion Rubber Company, Ltd.

In Europe:
Atlantic Chemicals SAB, Antwerp, Belgium

from A to Z

ammonium nitrate — *zinc sulfate*

fertilizers and ingredients travel economically in Bemis Bags



Which types of Bemis Bags? Here's a good yardstick . . .

Bemis Waterproof (laminated-textile) Bags if you have a really hard-to-pack fertilizer or fertilizer ingredient—one that requires special protection against moisture gain or loss, escape of odors, loss from snagging or tearing. This is the strongest shipping bag made—particularly suitable for export.

Bemis Flexiply Bags if you need a little less than the super-protection of Bemis Waterproof Bags. These laminated, all-crinkled paper bags are tough, shock-resistant, flexible . . . handle and stack easily.

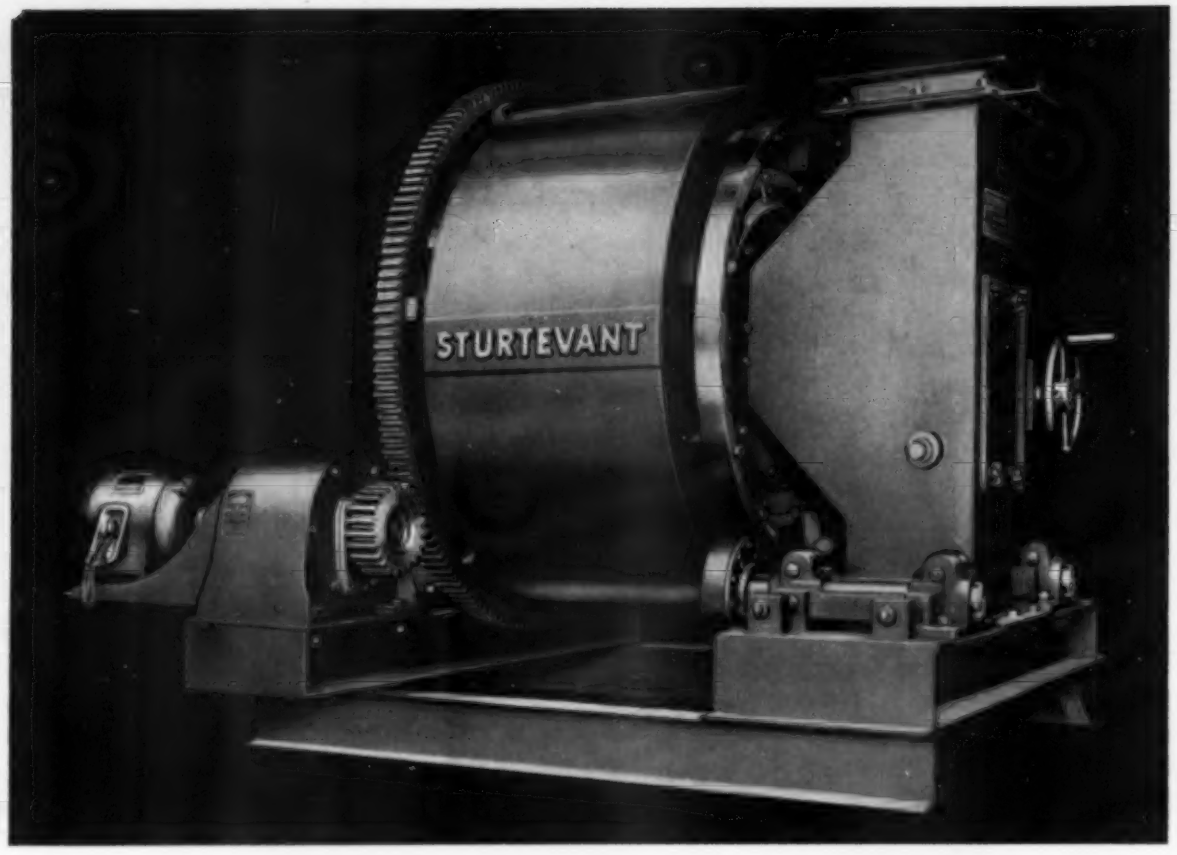
Bemis Cotton Bags if you want a sturdy, attractive bag with sales appeal and top-brand reproduction. Bemis Cotton Bags, white or dress print, are popular for their secondary household uses.

Bemis Burlap Bags if you are after maximum mileage . . . durable and economical.

Bemis Multiwalls if you want quality paper bags with the best multicolor brand printing in the bag business.

Bemis

408 Pine St., Box 66
St. Louis 2, Missouri



STURTEVANT *Dry-Batch* BLENDER

Provides Quick, Thorough Mixing of Materials ... Cuts Production Costs

Compare These Advantages

- Only one lever controls both receiving and discharging for simplicity of operation. Hand wheel operates rack and pinion slide at feed opening.
- 4-way mixing action speeds production . . . assures thorough blends.
- "Open-door" accessibility permits easy, fast, thorough cleaning.
- Single aperture drum for both intake and discharge.
- Unusually efficient scoops pick up materials to effect thorough mixing as drum revolves.
- 9 models . . . a size for every job . . . from 10 cu. ft. to 900 cu. ft. batches.

Sturtevant Dry-Batch Mixers are available in standard models with capacities from 500 to 20,000 lbs. Special models with higher capacities are also available. Write for information or engineering assistance.

Sturtevant Mill Company
123 Clayton Street, Boston 22, Mass.

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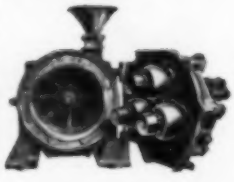
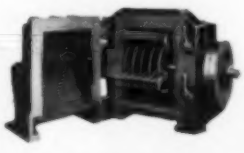
Other Sturtevant Equipment for Increasing Production

MICRONIZER® GRINDING MACHINE
A fluid jet grinding machine, the Sturtevant Micronizer speeds reduction of materials to low micron sizes. These jet mills are especially applicable in fields where a particle size in microns is desired. Available for outright sale.



RING-ROLL MILLS
For medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operated in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.

AIR SEPARATOR
For separation of fines to 325 mesh and finer. Increases output from 25% to 300% . . . lowers power costs by 50%. Capacities ¼ to 50 tons per hour output.



SWING-SLEDGE MILLS
For coarse and medium reduction (down to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.

your eye tells you why

International's New Triple Superphosphate so quickly received

unprecedented acceptance

In the fertilizer industry, few products have ever generated such ready and enthusiastic approval as International's new "fine-texture" Triple Superphosphate. When this new fertilizer ingredient was announced the first of the year, acceptance was immediate and widespread.

We at International appreciate your keen interest in this improved Triple Super . . . and your orders for it. They make the years of research and investment in developing this new product even more gratifying. If you have not yet had opportunity to see this new International product, we invite you to write the Phosphate Chemicals Division for samples and quotations.

Your first glance will tell you why its fine, uniform and virtually dust-free texture gives such improved results — promotes better granulation in high analysis plant foods — reduces the need to grind before mixing — assures thorough and more complete ammoniation.

MINERALS International CHEMICALS

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

General Offices: 20 North Wacker Drive, Chicago 6

Here's another way
LION IS HELPING YOU
sell more Nitrogen Fertilizer

Impressive, Big-Space Advertisements are Appearing Month-After-Month in all These Publications

Lion's Chemical Sales Division is working to make sure you, as a fertilizer mixer, sell more fertilizers. One way we help is by consistent advertising to dealers and farmers. This advertising emphasizes how plant foods can best serve the farmer by increasing his profits.

We also offer One-Stop Service—which means you can contract for your nitrogen requirements from a single dependable source, saving you time (which, these days, is money!). As for *quality*, you can build your own reputation on a solid basis when you depend on Lion quality.

And when you need assistance with a formulation problem, our skilled Lion technical staff is ready to help you.

Our great storage facilities and the variety and flexibility of our manufacturing operations assure you of prompt shipment.

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Lion Anhydrous Ammonia—For formulation. A uniformly high-quality basic product. Nitrogen content, 82.2%.

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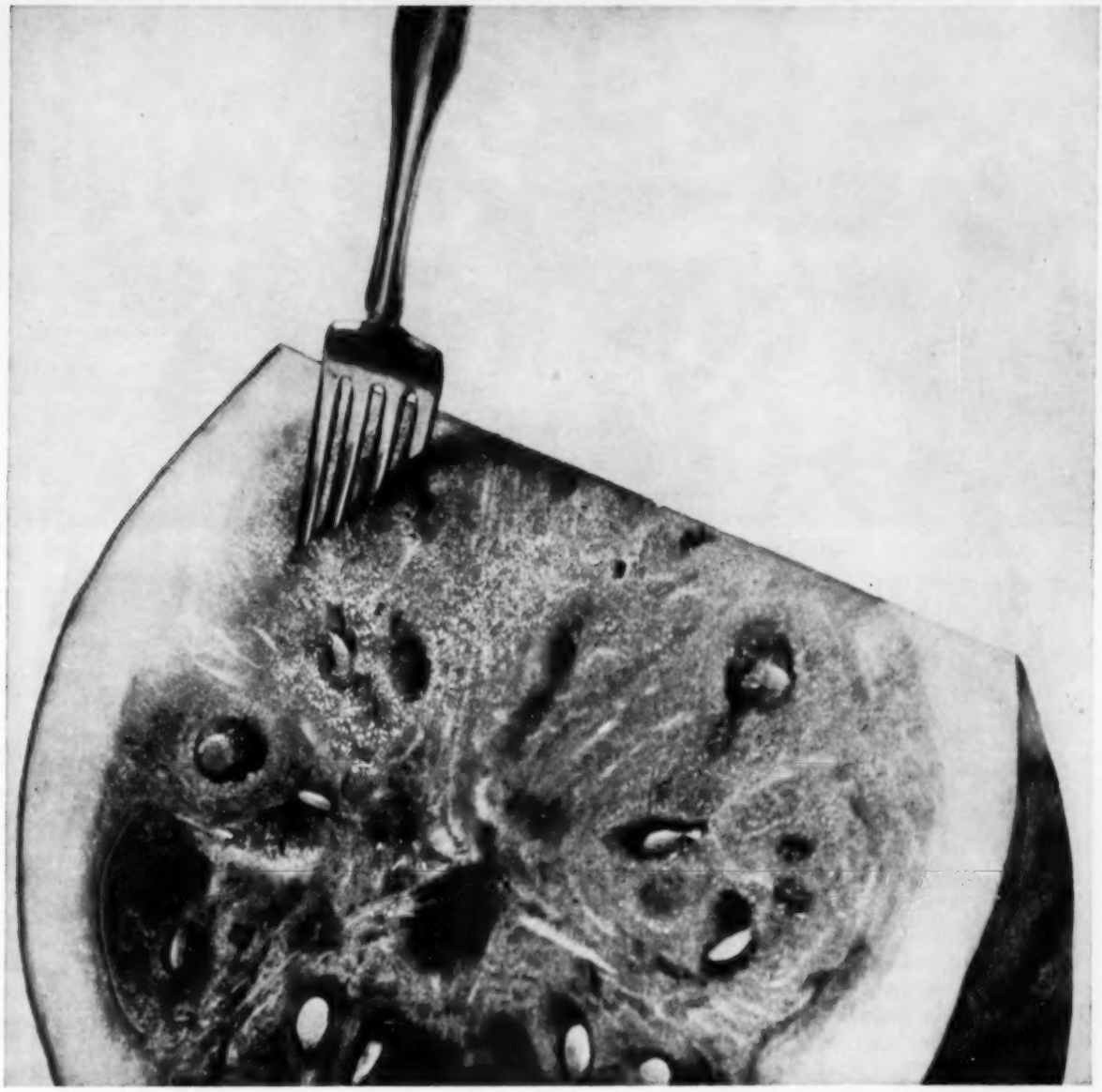

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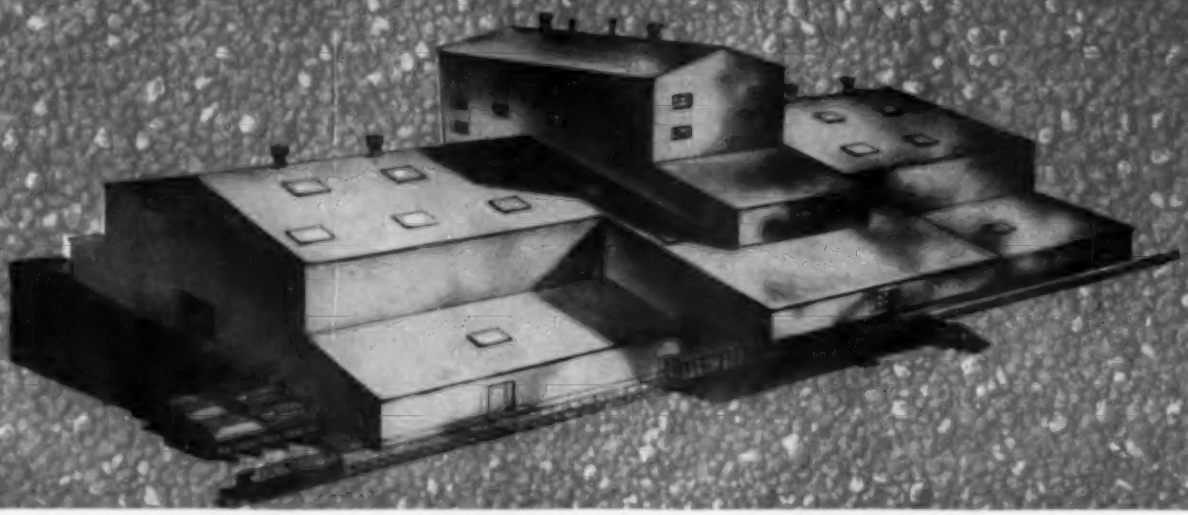

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JOHN F. GALE

John F. Gale has been named manager of market research of Garden Foundation, Inc., Baltimore, Md., according to an announcement by Norman M. Johnston, executive vice president. Mr. Gale's appointment was effective June 20.

Since 1950, Mr. Gale has served as economist and editor for The National Fertilizer Association. Nationally recognized for his studies on fertilizer production and consumption, he is the author of many articles about the economics of the fertilizer industry.

He has been editor of **National Fertilizer Review** since the fall of 1953, and also has edited various of NFA's special publications. He has served as secretary of NFA's Traffic Committee and has been active on the Plant Food Research Committee. He is a member of American Farm Economic Association, Advisory Council of Federal Reports, Industry Advisory Committee of Foreign Trade Commodity Classification and Atlantic States Shippers Advisory Board.

A one-time resident of Springfield, Ohio, Mr. Gale attended Wittenberg College where he was awarded his degree in economics. Prior to this, he was with Ohio Steel Foundry Company and Parker Pattern and Foundry Company. He served with the U.S. Navy in the Pacific from 1944 to 1946.

•

Announce Field Day

A horticultural field day will be held Aug. 17 at the Kansas State Horticultural Farm, Manhattan, Kan. Experimental plantings will be explained and there will be an opportunity to observe the regular vegetable and fruit crops at full growth.

•

Ag. Prods. Corp. Formed

W. W. Johnson, formerly with Smith-Rowland Co., Norfolk, Va., has recently organized his own company in Danbury, Conn. The newly formed Agriculture Products Corp. will deal in fertilizer raw materials.

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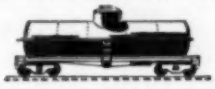
2 ANHYDROUS AMMONIA



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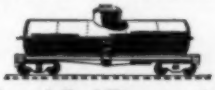

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Meeting Calendar

July 5-8 — Convention of Plant Food Producers of Eastern Canada, Bigwin Inn, Muskoka, Toronto.

July 14-15 — Southwest Fertilizer Conf., Buccaneer Hotel, Galveston, Texas.

July 21-22—Great Plains Agricultural Ammonia Association, Midwest Trade Show, July 21, Hotel Ft. Des Moines for members only. Field Day with Iowa State College, July 22, at Ames Ia. open to public.

July 27-28 — Northeast Branch, American Society of Agronomy, University Park, Pa.

Aug. 8-10—North Central Division American Phytopathological Society, Wooster, Ohio.

Aug. 9-11 — Ohio Pesticide Institute Meeting, Wooster, Ohio.

Aug. 9-12—Rocky Mountain Conference of Entomologists, Camoron Pass 4-H Club Camp, Gould, Colo.

August 10 — Kentucky Fertilizer Conference, Guignol Theatre, University of Kentucky, Lexington

Aug. 15-19 — Annual Meetings, American Society of Agronomy and the Soil Science Society of of America, California College of Agriculture, Davis, Calif.

Aug. 16 — Connecticut Agricultural Experiment Station, Field Day, Mt. Carmel, Conn.

Sept. 7-9—National Agricultural Chemicals Assoc., Annual meeting, Spring Lake, N. J.

Sept. 7-9 — Beltwide Cotton Mechanization Conf., Texas A&M College

Sept. 13-15, Western States Garden Supply Trade Show, Oakland, Calif.

Oct. 17-21 — National Safety Congress & Exposition, Chicago, Ill.

Oct. 18-20 — Entomological Society of Canada, Fredericton, B.C.

Oct. 27 — Middle West Soil Improvement Committee, annual business meeting, Sherman Hotel, Chicago.

Nov. 2-3—Pacific Northwest Plant Food Assn. Pilot Butte Inn, Bend, Oregon.

Nov. 7-8—California Fertilizer Assoc., 32nd annual meeting, Hotel Mark Hopkins, San Francisco.

Nov. 3-4—Northeastern Division American Phytopathological Society, Springfield, Mass.

Nov. 17-18 — Nitrogen Solution Field Day, State Armory, Springfield, Ill.

Nov. 28 - Dec. 1 — Entomological Society of America, Annual Meeting, Netherlands Plaza, Cincinnati.

Dec. 5-7 — Agricultural Ammonia Institute, Kansas City, Mo.

Dec. 15-16—Beltwide Cotton Production Conference, Hotel Peabody, Memphis, Tenn.

Jan. 4-6—Weed Society of America, Hotel New Yorker, New York City.

Jan. 10-11 — North Carolina Pesticide School, Raleigh, N. C.

Jan. 16-18 — N. W. Vegetable Insect Control Conf., Imperial Hotel, Portland, Ore.

Jan. 18-20 — Western Cooperative Spray Project, Imperial Hotel, Portland, Ore.

Jan. 24-26 — Midwestern Garden Supply Trade Show, International Exposition Hall, Chicago.

Feb. 15-17—California Weed Control Conf., Sacramento & Davis, California.

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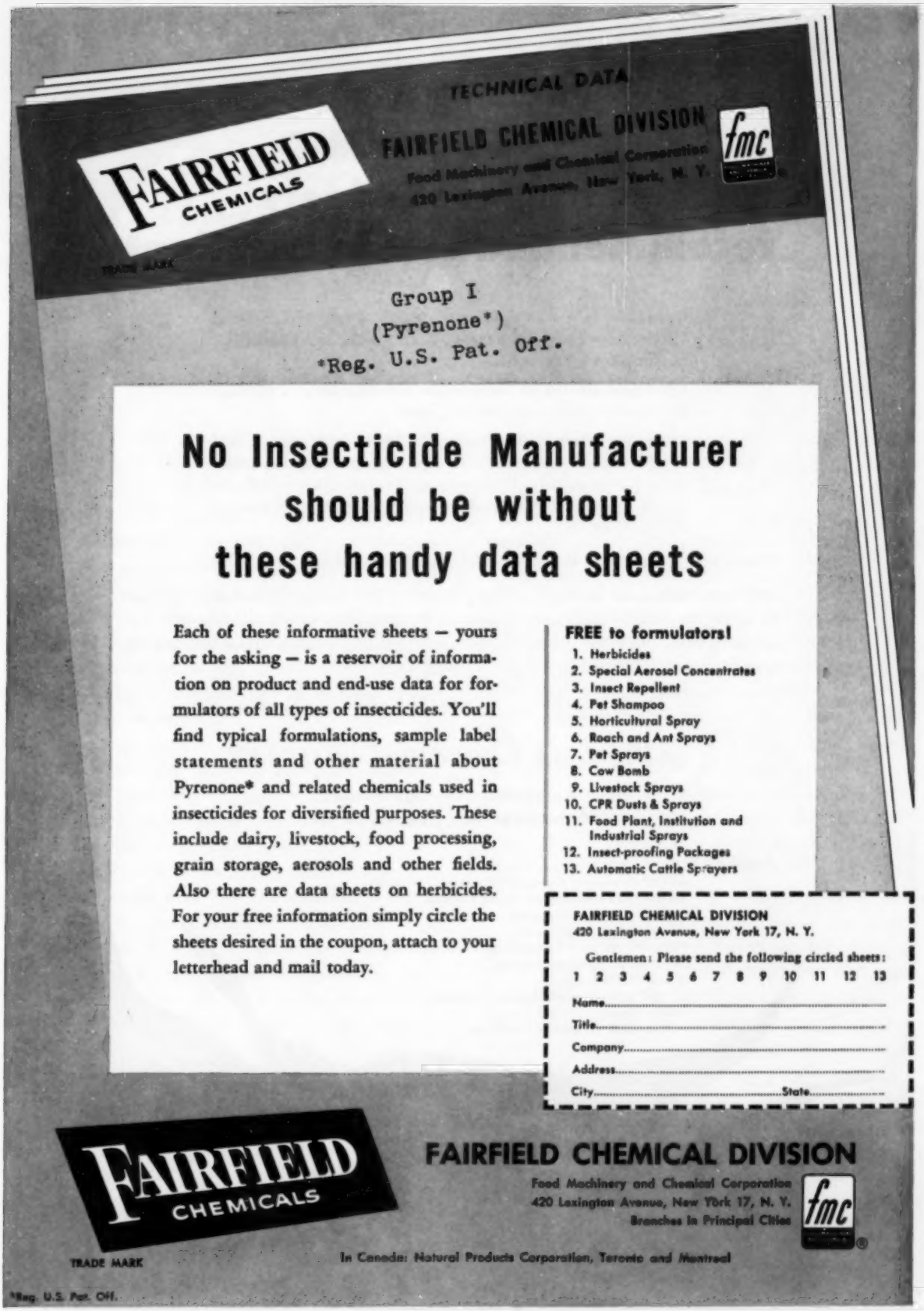
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Editorial
COMMENTS

IT was inevitable, perhaps, that the first season of operation under the Miller Bill would find insecticide manufacturers and research workers facing problems in adjusting to the new controls. It has come as a severe shock to many concerned with manufacture, testing and use of pesticides, however, to find that a rather rigorous interpretation of the sections of the law covering experimental registration of new pesticide materials is apparently throwing unexpected hurdles in the path of their development.

It had been thought that the Department of Health, Education & Welfare would allow a little wider latitude to experimental workers. However, it now seems apparent that such special consideration is intended merely for the "test-tube" stage of experimental testing, and that when large scale field application becomes necessary, no relaxation in the rigid controls is contemplated. With field data often needed before further work on a possibly valuable new compound can be justified, it seems apparent that such an attitude on the part of the Department could interfere seriously with development of new and in many cases more efficient and safer agricultural chemical tools.

Latest word from Washington seems to suggest that there may be some relaxation in the initial rather rigid stand by the Department on this problem. Obviously, HEW cannot stretch an interpretation of the law to the point where the public health might be endangered. But neither need they go to the other extreme of requiring for an experimental permit as much data as necessary on a product going directly into commercial use. It is to be hoped that a realistic policy will be worked out which will not put insurmountable obstacles in the way of development of new pesticides.

THE prompt and vigorous protest of the fertilizer industry against the TVA proposal to start the manufacture on a large scale of diammonium phosphate has apparently succeeded, at least for the moment, in limiting TVA's plans in this direction. The House Appropriations Committee has acted to restrict TVA production of this new fertilizer material to an annual figure (5000 tons) which can be considered in the range of experimental rather than commercial production (see page 55).

Here was an excellent example of the many evils of the whole idea of government agencies competing with private industry. Six commercial fertilizer manufacturers are at present making diammonium phosphate and their productive capacity is well above present demand for the material. Their cost of production, too, it has been clearly established, is well above the TVA selling price, for TVA can set its selling prices, if it so chooses, without any reference to important elements of cost like taxes which private industry must bear.

And while selling below commercial costs, or simply giving the material away under the guise of development and education, the government

(*Continued on Page* 104)

CLEAN, easy-to-handle aerosol products are bringing "backyard" gardeners the same benefits of spray application of pesticides enjoyed by big-scale farmers with expensive power spray equipment.

Still barely out of the early stages of product development, the pint-sized dispensers already offer the small consumer the advantage of push-button spraying for a wide variety of agricultural chemicals, ranging from insecticides and fungicides to pharmaceuticals for use on cattle and poultry. Many such products now sprayed with conventional power equipment represent a potential aerosol application for the consumer whose normal requirements are measured in ounces instead of gallons.

Back of the aerosol products' success is the unending search by the small-scale gardener for easier, better, less messy, and less time-consuming ways of taking care of his plants without sacrificing protection. And on all counts, the self-spraying aerosol packages rate high, for they provide scientifically formulated products that require no measuring or mixing and practically no physical effort to use.

Insecticides actually are the base of today's bustling aerosol industry, with its more than 80 different types of products, for they were the first product group to be packaged in an aerosol container a little more than ten years ago. Developed by U. S. Department of Agriculture chemists to protect World War II forces from insect-borne disease, they provided civilian consumers with their first taste of the convenience of the push-button package. And by the end of 1953, they accounted for nearly a third of the pressure-packaging industry's annual output of about 140 million aerosol packages.

Only in the last two or three years, however, has the aerosol package been adapted to dispensing agricultural chemicals, as distinguished from straight household insecticides for control of flies, mosquitoes, and similar common insects. Today, there are at least a dozen major types of agricultural chemical products in push-button packages with, the industry says, more on the way every week.

For control of aphids, red spider mites, Mexican bean and striped cucumber beetles, mealy bugs, soft brown scale insects and similar vegetable and flower plant pests, a typical aerosol insecticide contains pyrethrins, rotenone, piperonyl cyclonene, and petroleum oils in addition to the liquefied gas propellent that provides the dispensing pressure. Another

manufacturer's garden insect aerosol spray contains methoxychlor, lindane, and rotenone, and is claimed to be effective against pests such as aphids, Japanese beetle, red spider mites, leaf-hoppers, lacebugs, thrips, diabrotica beetles, and certain caterpillars.

Flower lovers, particularly those whose specialty is roses, have a new, easy-to-use aerosol weapon against their major disease enemy, Black Spot. In addition to the Black Spot fungicide, derived from phygon, the aerosol product contains pyrethrins and rotenone which combine to give the aerosol product control of Japanese beetles, aphids, thrips, and mealy bugs. It also has been tested and approved for control of various insects and diseases which attack dahlias, azaleas, geraniums, and many other garden plants.

All these products are carefully labeled to indicate the directions for use and conditions under which they give best results. In general, spraying distance should be from 12 to 24 inches from the plant, with care being taken to prevent overspraying, particularly of plants weakened by insect attack. Label directions should be consulted to determine how long before harvest spraying should be discontinued, and it's best to wash all sprayed foods thoroughly before use.

Another aerosol product of special interest to home gardeners is recommended for use on blossoms and buds of tomato plants, cucumbers, melons, and squash. Called a hormone blossom set, the product contains parachlorophenoxyacetic acid and is designed to increase yields and gain earlier maturity of a seedless fruit without normal pollination.

Because nearly every home owner who boasts a suqare foot of grass is plagued by the problem of weed control, recently introduced aerosol lawn weed killers are of wide interest. Most use 2,4-D as the weed-killing agent and are effective against such broadleaf weeds as dandelion, plantain, poison ivy, ragweed, pigweed, and dock.

While all the aerosol lawn weed killers deliver a spray of 2,4-D at the press of a button, special features differ among brands. One maker incorporates a white tracer in his formulation so the user can tell at a glance which weeds have been sprayed. Another mounts his aerosol container on a 28-inch cane that permits applying the spray without bending over. A plastic control cone over the valve of the latter "walking stick" product is also said to help confine the 2,4-D to the weed and prevent the spray from drifting to nearby grass or clover, both of which can of course be killed by the 2,4-D.

Poison ivy, poison oak, and poison sumac also are controllable by aerosol sprays packed in the push-button cans. In such products, 2,4,5-T, is the killing agent and the usual precautions against drift and fumes must be observed.

For small poultry-flock owners, an aerosol vapor inhalant spray protects chickens against chronic respiratory disease. Containing dihydrostreptomycin, it's sprayed over the flock in the brooder house, usually at night when the chickens are roosting, so the antibiotic settles down gently over them and is inhaled into the respiratory tract. According to the manufacturer, one 12-ounce container of the aerosol spray treats 100 birds in 30 seconds for about 2¾ cents per bird, with one spraying usually sufficient to curb the disease.

Other aerosol poultry sprays, containing such chemicals as ephedrine, chlorobutanol, menthol, eucalyptus oil, and oil of peppermint, are useful in treating simple non-infectious conditions of the upper respiratory tract of poultry, and aid in loosening accumulated mucus in the chickens' noses and throats.

A number of different preparations are available in the convenient aerosol packages for treatment of cattle, horses, and other farm animals. Horse flies, house flies, stable

(*Continued on Page* 109)

AEROSOLS in the HOME GARDEN MARKET

IRON CHELATES

in agriculture

By Hyman E. Boas

WITHIN recent years a new tool has been added to the kit of the soil-plant chemist. This new thing is called a "chelate," which means "claw." This claw, which is merely a peculiar arrangement of atoms in certain types of large organic molecules, has the ability to hold a metal in its grip. This can be iron, manganese, zinc, copper, cobalt, or any metal. The soil-plant chemist's interest in chelates is primarily in connection with supplying trace elements to plants and animals.

This article deals mainly with chelated iron. The claw-containing organic molecule that is generally used for chelating iron is ethylenediaminetetracetic acid (usually abbreviated to EDTA) or one of its close relatives. The sodium salt of the iron chelate compound dissolves readily in water.

Chelated iron has the peculiar quality of staying in a water-soluble form when placed in a nutrient solution or after being applied to the soil. The iron of common iron salts, such as the sulfate of iron, becomes insoluble under such conditions. The chelated iron is taken into the plant unchanged and moves upward to the growing points as such. Once this has occurred in an iron-deficient plant, its yellow leaves soon turn dark green, with resulting improvement in rate of growth and in fruitfulness.

Virtually all soils contain an abundance of iron. The need of plants for iron is very much less than that for any of the ordinary fertilizer elements or for those contained in liming materials . . . so one would not expect iron deficiency in orchards, groves, or field crops. Yet such deficiencies are widespread, notably in the irrigated alkaline soil areas of the West.

Until recently, it was generally assumed that plants growing on the acid soils of the East and South would have plenty of iron at their disposal. And, judging by the amount of iron found in them on analysis, this assumption was valid. Yet much trouble was often experienced in growing azaleas, rhododendrons, mountain laurel, blueberries, and similiar plants even on quite acid soils because of what appeared to be a lack of iron. Such difficulties tend to increase toward the South, notably on yellow-red latosolic soils, which are very high in iron.

Iron deficiency in plant leaves is characterized by a bright golden-yellow, which differs distinctly from the yellow commonly seen on nitrogen-deficient plants. This yellow differs also from that found on other chlorotic plants that, for some other reason, are not growing well.

In the alkaline-soil regions of the West, iron deficiency is so widespread and so troublesome that it is one of the major problems in fruit production. The first clue as to the remedy for the yellowing of the leaves of these fruit trees came when someone noticed the marked greening of the leaves that occurred above the points where wrought iron nails had been driven into the trunks. Out of this observation grew the practice of spraying fruits and vegetables with dilute solutions of iron sulfate. In lieu of this, much larger applications of the sulfate were made by way of the soil.

Photo above: Left iron-deficient citrus tree. Right . . . tree that received 50 grams of chelated iron applied to the soil under the spread of the branches. Equally good effects were produced in some cases by the use of 20 grams. These rates refer to the iron itself. The lower rate would be equivalent to about ½ pound of the iron chelate per tree. *Photo C. Leonard and I. Stewart, Citrus Exp. Sta., Lake Alfred, Fla.*

But the question rose as to why plants that contained plenty of iron—much more than they appeared to need—responded to applications of soluble iron salts. More thorough examination revealed that the iron in these chlorotic plants was not distributed evenly but tended to be deposited in localized areas. Thus, although the iron was inside the plant, it was not available to the plant at the points of need.

Organic chemists had long been aware of the peculiar properties of

Top, left: untreated tree in a 20-year old avocado grove on a highly calcareous soil (California).

Top, center: Chelate-treated in same grove as left photo. Response is slow on these soils, but quicker effects from less material are being obtained from some of the newer chelates that have been specially developed for such soils. *Photos C. P. North and A. Wallace, University of California, Los Angeles.*

Top right: Sunflowers growing in nutrient solutions containing 0.5 ppm iron. Left . . . iron supplied as the sulfate. Right . . . iron supplied as the chelate. *Photo L. H. Weinstein, Boyce Thompson Institute for Plant Research, Yonkers, N. Y.*

chelated iron, but nobody had made any attempt to apply this knowledge to meeting agricultural needs. In due time, however, plant physiologists with knowledge and imagination made use of such forms of iron in growing plants in nutrient solutions. They first used iron citrate, which contains its iron in a complexed condition that meets the requirements for a time. But the chelated iron was found to be much longer lasting in its effects.

These findings did not reach the field until recently. A few years ago Florida citrus growers began to be troubled by increased yellowing of the foliage of their trees. The problem was placed before the Citrus Experiment Station at Lake Alfred. There Ivan Stewart and Chester Leonard, after looking into the situation, applied their knowledge of the facts learned in plant physiology to good effect. Within a week or 10 days after chelated iron had been applied in powder form under the spread of the branches, the old leaves of the citrus trees turned green, and many new ones began to form.

The effects in Florida groves were so phenomenal that the word spread rapidly to other areas. California citrus and other fruit growers realized immediately that these findings were highly important to them. They applied the same materials in the same way. But the effects were not nearly as marked as they had been in Florida. In due time it was discovered that the cause for these much less satisfactory results lay in the alkalinity of the soils of that region. In other words, the iron chelates that were being used in Florida were not stable when applied to the alkaline soils of the West.

Commercial organic chemists are accustomed to running up against such problems. No matter how effective a given product is for some specific purpose in one area, there is no sure way of knowing in advance whether it will meet the requirements under different soil and climatic conditions. So these chemists set to work to develop additional forms of EDTA that could deliver iron to trees and other plants under the various conditions involved. Much improvement has already been effected, and more is to be expected.

Chelating agents are relatively new to soil-plant chemists, but they are old to the plants themselves. In fact, the highly essential enzyme systems in plants, through which the trace metals operate, hold these elements in chelated forms. When chelated iron arrives at the growing points within the plant, it must, to be effective, be able to find its place in the particular enzyme systems in which it plays its role.

Considerable mystery exists as to just how the iron moves from the chelated form in which it is supplied to the plant into the enzyme's chelated system. It has been suggested that, since the plant is a reducing system, the iron that is supplied in the ferric form in the chelate is reduced to the ferrous state in the plant. The ferrous iron chelate is much less stable than the ferric form. Therefore, the plant's enzyme system can compete more successfully with the EDTA for it.

It is known that manganese and iron must be available to plants in fairly definite ratios to each other. Within limits, iron deficiency and manganese toxicity are identical, both as to cause and effect. The same principle undoubtedly applies to all the

(Continued on Page 107)

J. A. HOWELL, Virginia-Carolina Chemical Corp., Richmond, Va., was named president of the National Plant Food Institute at the preliminary convention of the new organization, held June 12-15 at the Greenbrier, White Sulphur Springs, W.Va. Some 900 fertilizer manufacturers, industry representatives, educators, and government officials participated in the three-day meeting which this year, as of July 1st, sees the consolidation of the National Fertilizer Association and the American Plant Food Council.

E. A. Geoghegan, Southern Cotton Oil Co., New Orleans, La., was named chairman of the board of directors of N.P.F.I. Other officers assuming new posts July 1st are: executive presidents, Dr. Russell Coleman (former president of NFA) and Paul T. Truitt (former president of APFC); vice president, W. R. Allstetter; secretary, Louis H. Wilson; and treasurer, W. S. Ritnour.

All photos—

Top left: W. S. Haude, Grace Chemical Co.; S. L. Nevins, Olin Mathieson Co.; J. F. Criswell, Agricultural Ammonia Inst.

Top right: J. S. Devlin, Southwest Potash Corp.; R. E. Goodwin, Ashcraft Wilkinson Co.; D. Walsh, Olin Mathieson Co.; and W. M. Rowe, Ashcraft Wilkinson Co.

Bottom left: R. W. Crabtree, Hercules Powder Co.; Van Irwine and G. Monkhouse, Shell Chemical; and A. Mohr, Calif. Spray Chemical Corp.

Bottom right: F. T. Techter, Allied Chemical & Dye Corp., N. Y.; Mr. and Mrs. D. C. Oakin, Westvaco Minerals Prod., Food Mach. & Chem. Co., N. Y.; H. F. Roderick, Int'l. Minerals & Chem. Corp., Chicago; Hugo Riemer, Nitro. Div., Allied Chemical & Dye Corp., N. Y.

Other members of the executive committee are: Louis Ware, Chicago, president of International Minerals and Chemical Corp.; W. E. Shelburne, Atlanta, vice president Armour and Co. and president Armour Fertilizer Works; Ralph B. Douglass, Norfolk, Va., president of Smith-Douglass Co., Inc.; John A. Miller, Louisville, Ky., president, Price Chemical Co.. J. E. Totman, Baltimore, Md., president of Summers Fertilizer Co., Inc.; Edwin Pate, Laurinburg, N.C., president, Dixie Guano Co.; and George E. Petitt, Washington, D.C., vice president, Potash Company of America.

F-P Mixtures Reviewed

A NUMBER of questions concerning product liability, production methods and hazards in manufacturing F-P mixes were discussed in a forum on "Problems Relating to Fertilizer-Pesticide Mixtures," for which M. V. Bailey, American Cyanamid Co., New York, acted as moderator. Other members of the

Joseph Howell Named to Head N. P. F. I.

At Organizational Meeting

panel included: K. D. Jacob, USDA, Fertilizer and Lime Section, Beltsville, Md.; C. T. Harding, Virginia-Carolina Chemical Corp., Richmond, Va.; Rodney C. Berry, Virginia State Chemist; and John D. Conner, Sellers & Conner, Washington, D.C.

"The use of pesticides mixed with turf grass fertilizers is widespread and on the increase," commented M. V. Bailey, "but the total volume," he said, "is still relatively small. In recent years, comparatively large tonnages of standard complete fertilizers mixed with pesticides have been made." Mr. Bailey pointed out, however, that "Up to this time, no advantage has been found for fertilizer-pesticide mixtures, excepting that of economy in the field operation. There are no data to prove," he emphasized, "that the mixing makes the plant nutrients in the fertilizer any more quickly available or longer lasting, or that the pesticide is made more effective . . . but labor is a major farm expense item and the efficient farmer is continually on the alert for savings."

Mr. Bailey reminded fertilizer manufacturers that the problem "may be one of simple arithmetic. Can you mix fertilizers and pesticides," he asked, "for a price which will give the consumer a saving in labor cost for their application?"

Although the quick solution to the problem of F-P mixtures would appear to be to put the two compounds together, and deliver the mixture to the farmer, Mr. Bailey reminded that in practice this is not without serious objections and obstacles. The handling of pesticides in the fertilizer factory introduces problems in industrial hygiene. . . . Besides the manufacturing problems, the farmer must be taught how to use the mixtures safely. The question of harmful residues in the soil must be investigated, as these will vary with soil types, and possible effects on flavor and odor of crops must get attention.

Mr. Bailey outlined some of the questions which may confront fertilizer manufacturers in deciding whether or not to assume the various problems involved in producing F-P mixtures. He reminded his listeners that "Those who will render the most service to their customers in this connection are those who can approach the problem not as something unpleasant, difficult and expensive, which should be avoided as long as possible, but as an opportunity to produce something the consumer wants or can use to his advantage." He suggested that perhaps one hopeful solution to this question may be that applicators may be developed which, when added to the standard fertilizer broadcasters, or ones attached to planting machines, will apply either solid or liquid pesticides along with fertilizers at the desired location in the soil. "This method," he said, "has numerous advantages to the farmer, the most important of which is the flexibility it offers in changing rates and ratios of fertilizers and pesticides."

Manufacturing Problems and Questions

DISCUSSING "Manufacturing and Safety Hazards in Fertilizer-Pesticide Mixtures," Charles T. Harding referred to the operation as one which offers the following seven basic problems: proper mixing; analysis; public relations; product liability; tags, labels, and registration; safety precautions; and frequency of changes occasioned by differences in grade and amount of pesticides required.

He pointed out that "The commonly used insecticide materials can best be incorporated in a fertilizer if used in liquid form by spraying the proper amount of insecticide on a pre-weighed amount of fertilizer . . . this is to be done in a batch or ribbon type mixer. The insecticide material should be sprayed on the tumbling mix slowly, and the mixer should make several revolutions after all the liquid has been introduced. Solid small granular material can also be

mixed satisfactorily with the same type of equipment.

"In a number of operations at the present time, the liquid spray, in the case of a liquid material, is calibrated and is sprayed on top of the fertilizer on a belt moving into the bagging machines. . . . Just how satisfactory this is going to be remains to be seen. Would you consider this safe mixing?" asked Mr. Harding of his audience.

Mr. Harding indicated that a few mixers just add the materials to the fertilizer in solid form as it is being bagged. How well such goods satisfy the trade is also open to serious question.

In some states, the guaranteed amount of insecticide in the F-P mix

(1) E. Phillips, G. L. F.; Mrs. Caspari; E. W. Harvey, Allied Chemical & Dye Corp.

(2) J. F. Ten Eyck, International Ore & Fertilizer Co.; Mrs. Caspari; Mrs. Ten Eyck, and Mr. W. Caspari, Davison Chem. Co.

(3) R. S. Mueller, R. S. Mueller & Co.; V. Sauchelli, Davison Chem.; A. Bowers, Swift & Co.; M. McVickar, N.P.F.I.; T. Adcock, Swift & Co.

(4) Mrs. and Mr. S. K. Bradley, Union Bag & Paper Corp.; John R. Taylor, Grand River Chemical Co., and R. Allstetter, NPFI.

(5) J. Morse Smith, and W. E. Merritt, H. J. Baker; D. T. Fangmeyer, Olin Mathieson Chem. Corp.; T. Wright, Texas Farm Products; and D. Kelly, Lion Oil Co.

(6) G. W. Suggs, Allied Chemical Co.; Mr. and Mrs. Bruce Cloaninger, Assn. Amer. Fert. Control Officials.

(7) F. Ronan, Grace Chemical; Leo McCabe, Jam Handy; W. Johnson, U. S. I.; W. Marsh, Hercules Powder Co.; and W. Haude, Grace Chemical Co.

(8) Walter Sackett, and J. L. Proeser of A. J. Sackett & Sons; J. C. Crissey, G. L. F.; Mrs. D. Harper, L. A. Krebs, and B. H. Brewster, Sr., of Baugh & Sons.

(9) Del Rucker, N.P.F.I.; J. C. Totman, Summers Fertilizer Co.; G. D. Glover, French Potash & Import; and E. Kapusta, now with U. S. Potash Co.

(10) L. W. Gopp and H. F. Roderick, Intl. Minerals; B. W. Bellinger, Tennessee Corp., S. T. Keel and F. A. Koechlin, Intl. Minerals.

(11) F. L. Holland, Florida Agric. Res. Inst.; and Mrs. and Mr. Paul Truitt, N. P. F. I.

(12) C. W. Collier, H. Maddux, and H. Nowak, all of Potash Import & Chem. Corp.

is so small that tolerances are also small . . . and to stay within such limits gives the mixer very little leeway for error in mixing or sampling. This introduces the question of how to get a good mix and representative sample of the goods.

Even more serious than manufacturing problems and hazards, however, is the question of product liability, which Mr. Harding said, is the one factor which is keeping some fertilizer manufacturers out of F-P mixture production.

Mr. Harding reminded also that another factor to be considered is that "once farmers get in the habit of getting their pesticides mixed in their goods, we are then going to be expected to continue such mixtures regardless of how objectionable or dangerous new materials may become. We are setting a precedent now," he said, "that may be embarrassing at some later date."

"If our industry had any reasonable assurance that this practice were here to stay, for even several years," Mr. Harding commented, "we could afford to install proper equipment to do this job on a uniform, economical basis and eliminate most all of the problems that now give us concern The fertilizer industry itself, I am quite sure," he concluded, "would rather not be called upon to furnish these mixtures; however, we have always been interested in the farmer's day-to-day problems and until a better and more economical means of applying these pesticides is found, I am quite sure we will find ways and means of mixing and delivering these goods."

Product Liability

ON the "Product Liability Aspects of Fertilizer-Pesticide Mixtures," John D. Conner outlined various questions to be considered in undertaking the manufacture and sale of the new products. "The fact that the precise manner in which a potential injury may arise cannot be foreseen," he cautioned, "makes the need for careful planning all the more imperative. The injury may be to plants grown in soil treated with the mixture just prior to planting, or the injury may arise in subsequent years from soil contamination resulting from application in earlier years. Whatever the type of injury may be," Mr. Conner continued, "it would arise in all probability because of one or more of three basic deficiencies:

1) Failure to conduct adequate research prior to marketing the product to determine its capabilities and its limitations.

2) Failure to use adequate production controls or methods to assure that the product actually produced and packaged accords with the standard product.

3) Failure to label or advertise the product in accordance with statutory standards. (R. Berry conducted a state-by-state survey on laws and policies concerning F-P mixtures which is summarized on pages 46-47 of this issue.)

Mr. Conner cautioned his audience "Not to make the mistake of believing that just because a fertilizer-pesticide mixture has been accepted for registration by both the pesticide and fertilizer control officials, it thereby meets the regulatory requirements of both laws. Bear in mind," he said, "that in a liability suit premised

(13) Chairmen of technical committees reporting to N. P. F. I.: A. Bowers, Swift & Co.; J. Garman, N. P. F. I.; P. Hull, Spencer Chemical Co.; E. Kapusta, now with U. S. Potash; V. Sauchelli, Davison Chemical Co.; and M. V. Bailey, American Cyanamid Co.

(14) U. S. Jones, Olin Mathieson Co.; R. W. Scanlan, Phillips Petroleum Co.; H. H. Tucker and H. J. Coleman, both of Sohio Chemical Co.; and A. J. Dickinson, Virginia Carolina Chem. Corp.

(15) Standing: Mr. and Mrs. J. A. Naftel, Jr., J. R. Turner, J. F. Corkill. Seated: Mrs. Corkill and Mrs. Turner; all of Pacific Coast Borax Co.

(16) B. M. Machen, Lion Oil Co.; Mrs. Machen; Mrs. Goldthwaite; R. W. Goldthwaite, Lion Oil Co.

(17) Members of panel on "Problems Relating to Fertilizer—Pesticide Mixtures:" K. D. Jacob, U. S. D. A.; J. D. Conner, Sellers & Conner; C. T. Harding, Virginia-Carolina Chemical Corp.; M. V. Bailey, moderator, American Cyanamid Co.; and R. C. Berry, Virginia state chemist.

(18) G. D. Baerman and A. Weed, Olin Mathieson Chem. Co.; H. B. Cunningham and L. S. Kaniecki, both of Tennessee Corp.; and Silas Besthoff, Faes & Besthoff.

upon statutory violation, it will be the jury and not the regulatory official who will determine whether your product met the statutory requirements."

Mr. Conner reviewed several means of using batch numbers to identify all sales . . . and urged keeping a representative sample from each batch as long as practicable. Identification by batch number may have a real value in enabling the manufacturer to identify questionable batches at some later date, even though containers and other data may have been destroyed.

He recommended that manufacturers "include a disclaimer, or a non-warranty statement, as a standard part of their label, contract, invoice and other documents incident to the sale of a fertilizer-pesticide mixture. Such a disclaimer," he warned, however, "is not a cure-all. It is not a substitute for adequate labeling of a sound product. But if it is properly drafted and used, it may play an important role in reducing your contingent liability."

State Laws and Policies

RODNEY C. Berry reviewed the state laws and regulatory policies affecting the sale and distribution of fertilizer-pesticide mixtures. He pointed out that an agricultural pesticide is considered as a substance formulated for the mitigation of pests which retard desired plant growth, such as insecticides or fungicides; the select destruction of undesired plant growth, such as herbicides; or other uses such as defoliants, inhibitors, or bactericides. The distribution of fertilizers, he advised, is regulated by law in 47 states, and the distribution of pesticides is regulated by federal law and by-laws in 41 states.

Mr. Berry advised that "Under most laws, the manufacturer is held responsible if the pesticide, when used as directed, *or in accordance with common recognized safe practice,* be injurious to living man or other vertebrate animals or vegetation to which it is applied, or to the person applying such pesticide. No comparative responsibility to my knowledge," he said, "appears in any fertilizer law." In the fertilizer-pesticide mixtures, Mr. Berry pointed out that "under the Federal Act, the pesticide is the active ingredient and the fertilizer is the diluent or *inactive* ingredient, and such mixtures passing in interstate commerce must be registered."

To establish a uniform policy in regulatory control of F-P mixtures, the following resolution has been adopted by the Association of American Fertilizer Control Officials, the Association of American Pesticide Control Officials, and by the Experiment Station Committee on Organization and Policy:

> 1. In view of the long lasting effects of the misapplication of pesticides, it is recommended that fertilizer control officials of this Association not register or permit the sale or the custom mixing of fertilizers containing pesticide for field crops, unless such mixtures have been formally approved by the Officials of the Agricultural Experiment Station or other officials vested with such responsibility by Law in their State.
>
> 2. It is believed that the use of fertilizers and pesticides is generally based on the economics of the practice and that the danger of contaminating crops or soils or both by misapplication, by inappropriate levels and methods of application is real and does not warrant the savings in labor costs.
>
> 3. Mixtures of pesticides and fertilizers which are registered for sale should be properly labeled and meet all requirements of both the fertilizer and pesticide laws of the various states.

Mr. Berry pointed out, however, that many state laws permit "Buyers Mixtures" and that such sales are not always subject to the same regulatory procedure applicable to open market sales. "Most agronomists," he advised, "are somewhat skeptical about the practical use of these mixtures. The rate and time of application, and the placement of the fertilizer rarely coincides with the most effective time and placement of the pesticides. Most entomologists prefer other means of applying pesticides, but agree that the use of these mix-

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Left: Mrs. Tom Jones, Tom Jones, Arkell & Smiths, and Mrs. Whitsel, Union Special Machine Co.

Center: Ralph Dorland, **Agricultural Chemicals,** and Jim Carpenter, Koppers Company.

Right: Louis Wilson, vice-president of NPFI (center) presents 1954 Soil Builders Awards to V. C. Weidner (left) of Successful Farming who accepted it for Kirk Fox, **SF** editor, and Tom Leadley (right), editor of the **Nebraska Farmer.**

recent developments . . .

codling moth control

by D. W. Hamilton*

Agr. Res. Res. Serv., U.S.D.A.
Fruit Insects Section
Vincennes, Indiana

DURING the past decade, DDT has been the material used most generally for codling moth control. Control with it has been so outstanding that it is now considered as a standard for comparison of other insecticides. Nevertheless, as brought out by other workers at this meeting, instances have occurred where DDT has not maintained the control of codling moth desired. Failure of DDT to control certain other insects and mites that attack apples and, oftentimes, its tendency to reduce their natural enemies so that these pests increase in numbers is also well known. These factors, when combined, make it desirable to consider the newer developments in codling moth control.

Hamilton, et al (1954), Hough and Hill (1954) and Glass (1954) have published summaries of their results in controlling codling moth with most of the newer organic insecticides.

Chlorinated hydrocarbon insecticides:

NUMEROUS chlorinated hydrocarbon insecticides, many of which are closely related to DDT have been evaluated for their codling moth control. Only two offer sufficient promise for consideration here. These are methoxychlor and TDE.

Methoxychlor is less effective than DDT under midwestern conditions, and adversely affects the finish of the Golden Delicious variety more than DDT. Larvicidal efficiency for 4-field-laboratory tests made at Vincennes, Indiana in 1954 averaged 95.7 for fresh deposits of methoxychlor and 65.3 for 9 day old deposits, in contrast to 96.9 and 84.7 for deposits of DDT. Newcomer and Dean (1954) secured better control of codling moth for the past 3 years with methoxychlor than with DDT. States in the northwest are including it in their recommendations to growers for 1955.

Since methoxychlor is effective against curculio, it is widely used in general purpose or "one shot" sprays, formulated for backyard use. Methoxychlor has been suggested for use to growers by several states in the East where curculio is present, and codling moth infestations are light. Because the tolerance for harvest residues of methoxychlor is greater than for DDT, methoxychlor is useful as a late season spray. Further experimental work with this material seems warranted.

TDE, although less effective than DDT, reduces codling moth injury. It has been included in New York State recommendations in cover sprays, where codling moth activity is light, and red-banded leaf rollers are active. Hough and Hill (1954) state that it has little larvicidal efficiency, but that it is exceptionally effective in killing adult moths. Tests with TDE for codling moth control at Vincennes have not shown it to be particularly promising.

Organic Phosphorous Insecticides

PARATHION has been recommended by most states as a control for codling moth. At present, its place in the spray program is still unsettled. At high dosages it has russeted fruit of the Golden Delicious and, probably in some instances, Jonathan varieties, especially when applied during the period fruit is in the pubescent stage (calyx and first cover). At high dosages it has also injured the foliage and fruit of McIntosh and related varieties. In West Virginia it has been reported as reducing fruit-bud set. The strongest objection to parathion is the hazard of handling it. It is highly toxic to humans and special precautions must be taken to assure its safe use.

Experiments conducted at Vincennes since 1947 have shown that parathion is more toxic to the codling moth than DDT but, because deposits are short-lived, it is less effective than DDT when used alone. Parathion

*Presented at the North Central Branch Meeting of the Entomological Society of America, March 24-25, 1955, East Lansing, Michigan.

not only prevents codling moth eggs from hatching, but it also kills adult moths and larvae that have recently entered the fruit. A mixture of parathion with DDT is, at present, the most effective control for the codling moth in southern Indiana. For example, plots sprayed with ½ pound of 15-per cent parathion, plus 1½ pound of 50-per cent DDT, per 100 gallons throughout the 1954 season averaged 1.0, 3.4 and 0.2 per cent of wormy fruit on the Turley, Grimes and Golden Delicious varieties, respectively, whereas those sprayed with 2 pounds of 50-per cent DDT averaged 1.4, 11.3 and 0.7 per cent of wormy fruit.

Inclusion of parathion in the summer sprays has given control of Forbes scale and, when 1 pound of 15-per cent parathion was used in 100 gallons, has reduced apple aphid populations. It can no longer be relied upon to control orchard mites because they have developed resistance to it in many places.

Malathion has also been tested extensively for use in controlling codling moth. Early tests with malathion were not very promising. Control obtained in 1954 where malathion was used with DDT was more promising. Only 0.4 per cent of the fruit was wormy in a block of Turley applies that received 9 cover sprays of DDT plus malathion, as compared with 1.4 per cent where DDT was used alone. Total fruit injury was in about the same proportion, averaging 1 per cent where malathion was included and 3 per cent where DDT was used alone. The combination spray contained 1½ pounds of 50-per cent DDT and 1 pound of 25-percent malathion per 100 gallons.

Malathion is effective against adults and eggs and against young larvae within the fruit, but less so than parathion. In laboratory tests, 2 ounces (actual) malathion in 100 gallons killed 80 per cent of the eggs and 60 per cent of freshly entered larvae in the fruit, whereas 1.2 ounces (actual) parathion killed 92 per cent of the eggs and 93 per cent of the larvae in the fruit. In the same tests, 1 pound (actual) DDT in 100 gallons killed 26 per cent of the eggs and 23 per cent of the larvae.

Malathion does not russet yellow varieties or injure the McIntosh and related varieties as does parathion. Like parathion, it will control Forbes scale, but it cannot be depended upon for mite control. Malathion is much safer to handle than parathion.

Malathion deposits are less persistent than those of parathion. It is suggested for use with DDT in situations where parathion cannot be used and by growers who will not use the parathion-DDT combination but have need for improved codling moth control and to control scale insects.

A third phosphorous insecticide that has been very effective in controlling codling moth is Diazinon, o-o-diethyl-o-(2-isopropyl - 4 - methyl pyrimidyl (6)) thiophosphate. At ¾ pound (actual) per 100 gallons, Diazinon has maintained better control of the codling moth than DDT in experimental plots for the past two seasons. For example, in 1954, per cent codling moth entrances in these plots averaged 0.3 for Turley, 0.4 for Grimes and 0.1 for Golden Delicious, in contrast to 1.4, 11.3 and 0.3, respectively, where DDT was used. 9 cover sprays were applied to the Turleys and 8 to the Grimes and Golden Delicious. Control was also satisfactory where Diazinon and DDT were combinated at dosages of 4 ounces Diazinon to 12 ounces DDT to 100 gallons. Per cent fruit with entries in field plots averaged 0.4 for Turley apples and 1.6 for Grimes. Reports from workers in New York, Washington, Ohio and West Virginia also indicate that Diazinon is one of the most valuable insecticides ever tested for control of codling moth.

Tests made during 1954 show that Diazinon, like parathion, kills many of the newly entered larvae within the fruit and kills large numbers of adults that come into contact with the spray. It is also a promising scalicide, aphicide and miticide. The finish of fruit sprayed with Diazinon was not entirely satisfactory in 1954, apples of the Turley variety had a dull rough finish and those of Golden Delicious were severely russeted. Although Diazinon is toxic to humans, it is much less so than parathion. Diazinon has not yet been registered for use on fruit.

Pirazinon, o,o-diethyl 1-o (2-N propyl-4-methyl-pyrimidyl (6)) thiophosphate, tested in 1954, an insecticide closely related to Diazinon, gave control similar to that secured with Diazinon. Pirazinon will not be available for testing in 1955.

Systemic Insecticides

RECENT development of systemic insecticides opens a new field for control of codling moth. Most of the systemic insecticides that have been studied thus far have been the most effective against insects that feed chiefly on sap, especially aphids and mites. However, some of the newer systemic materials now under study also affect chewing insects. Progress with systemics will be slow because of difficulty in determining just what happens to the compound after it has been absorbed by the plant. The possible hazard to the human consumer must be carefully evaluated. However, with many of the new systemics the effect lasts only a few weeks.

Insecticide (Per 100 gallons)	% Reduction Over Check (Unsprayed) 3 day old deposits	
	Entries	Injuries
12008 (48.5%) 1 pt.	100	37.7
OS-2046 (tech.) ½ pt.	100	52.7
Parathion (15) 1½ lb.	100	88.8
DDT (50%) 2 lb.	100	100

During 1954, exploratory tests, using 2 systemic insecticides for the purpose of determining their larvicidal efficiency, were made at Vincennes. In these tests, fruit sprayed in the field was left on the trees for a period of 3 days and then infested with larvae. Both systemics tested, 12008 (o,o diethyl s-isopropyl mercapto methyl dithiophosphate) and

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Washington's Agricultural Experiment Station

Top Photo: WSC researcher examines plants used in virus transmission tests with insects for western X-disease of peaches.

Bottom Photo: Beans . . a big crop in the Columbia Basin and largely because of research done by state and federal scientists.

CHANGING base metals to gold—that was one of the objectives of the ancient alchemist. Today's agricultural chemist—whose science grew out of alchemy—has much the same objectives. Only he's trying to create "gold" in the form of more and better food and fiber from the soil.

His chemicals are powerful tools to help bring about that transformation. So useful are these tools and so widely used, that today's farmer twirls such initials as DDT, 2,4-D, IPC and others around on his tongue with a good deal of familiarity. He may not understand exactly what they mean chemically or how they came about. But in the concrete terms of higher yields, less disease, and better agricultural products, he's sure what they mean.

Groups of scientists such as are assembled in the land-grant colleges and universities over the nation have served to aid the farmer in his use of these chemicals. Work going on in the Washington Agricultural Experiment Stations with agricultural chemicals is more or less typical of what's going on in each of the land-grant institutions.

Possibly the fields covered by these State College of Washington researchers are a bit broader than in many states, since Washington grows some 287 crops commercially, has rainfall ranging from practically none to over 150 inches a year, altitude from sea level to timberline, and soil types in the hundreds. But the usefulness of chemicals in solving some of these problems is everywhere quite evident.

4:1 Return on Fertilizer

TAKE fertilizers for example. Chemical fertilizers have really come into their own in the Pacific Northwest's wheat growing region. U.S. Department of Agriculture and state college scientists have demonstrated that farmers can—within practical limits—as a rule of thumb raise about $4 worth of additional wheat for every $1 they put into fertilizer. Where there's plenty of rainfall, nitrogen is the limiting factor in wheat production. Where lack of water's a problem, the nitrogen has to be adjusted to fit the rainfall as much as possible. But the use of chemicals in various forms— ammonium nitrate, ammonium sulphate, anhydrous ammonia, and liquid ammonia —has given a real boost to wheat production in this area.

Not only does nitrogen improve yields, but in areas where there's enough rainfall, it has made possible an annual cropping program which saves the organic matter content of the soil. Until college experimenters proved the feasibility of such a program, wheat land had been allowed to lay fallow every other year. Scientists found there had been a 34 per cent loss of soil organic matter under such a program in the 39 years before 1921, and a 17 per cent loss between 1921 and 1952. A fertilizer-straw combination under the annual cropping program actually increased the organic matter content of the plowed layer by 13 per cent! And nitrogen alone or as a supplement to wheat straw of the previous crop gave an average increase of 10 bushels of wheat per acre.

Deficiencies of other elements have shown up in various ways around the state. One of the most general is the lack of zinc. Washington's Columbia Basin, soil scientists say, is probably the most zinc-deficient area in the world. Zinc's a "minor" element—plants need only very minute quantities of it. For example, 3,000 pounds of field beans—a good acre yield—contain only .06 pound of zinc. Without that tiny amount, however, per-acre yields of beans would drop 500 pounds.

USDA researchers planted a zinc "garden" a couple of years ago. It included 26 crops with and without zinc fertilization in two adjacent areas. One area had produced severe zinc deficiency symptoms in corn the year before and the other had not.

Crops which showed zinc-deficiency symptoms were: castorbeans, field beans, lima beans, sweet corn, field corn, Sudan grass, Concord grapes, hops, soybeans, flax, and tomatoes. Crops not showing symptoms were: wheat, oats, barley, safflower, peppermint, potatoes, carrots, onions, sugar beets, red clover, alfalfa, asparagus, mustard, peas, and grain sorghums.

Because of this and similar work, these men were able to anticipate a problem that farmers in the newly irrigated areas of the Basin would face and to find a solution for it. They say fertilization with 8 to 10 pounds of zinc per acre, as $ZnSO_4$, decreases the severity of the symptoms or prevents them entirely. Zinc can be put on either as a spray or added to the soil. The latter's cheaper and lasts longer, according to the research men.

Another fertility problem Washington's soil scientists have run into is the fact that western Washington soils tie up large quantities of phosphorous in unavailable forms when fertilizers are applied broadcast and worked into the soil. This was a definite problem for the strawberry industry there. The answer these men came up with was to band the phosphate so that no plant is over 4 or 5 inches from a good supply of phosphorus when grown in matted rows 12 to 16 inches wide. This was done by placing the phosphate fertilizer in two bands about 6 to 8 inches apart and 3 to 4 inches below the surface. The strawberry plants grow between these two bands. There is no danger of "burning" the strawberry plants if they are set too close to either of the bands. But the more centered they are between the two bands, the more certain it is they'll have access to enough phosphate.

Another fertility problem WSC scientists have whipped with chemicals is a strange disease that appeared some 10 years ago on pear trees in southwestern Washington. Infected trees dropped their blossoms and leaves in the late spring. Within 10 days, they seemed to have died. Later in the summer, however, they recovered and grew new leaves—but no crop of pears. Scientists discovered first that the trees were suffering from a deficiency of boron. However, they were unable to check the disease by boron applications. Recently, they discovered that boron sprays applied to the trees and put on at just the right time — right after harvest — checked the disease.

This blossom blast cost farmers thousands of boxes of pears each year. Now, because of this research, this costly disease can be controlled and prevented with a few cents worth of boron sprayed on at the correct time of the year. Only 2 to 3 ounces of boron per tree is needed. That's about 1/2 cent a tree.

That's a sampling of the way chemical fertilizers have helped Washington's agricultural scientists solve fertility and nutritional problems of their state.

DDT Harmful to Plant Growth

ANOTHER place where chemicals have paid off in agriculture has been in insect control. Take Washington's fruit industry, for example. With newer and more effective insecticide sprays, scientists have cut the number of insect sprays in half. And the cost of insect control in apples and pears has been cut by some 17 cents a box. That saving's worth some $6,000,000 a year to the state.

Were it not for chemicals and the know-how to use them, Washington's agriculture could easily find itself on the ropes in the battle against insects. The codling moth at one time threatened to wipe out this state's apple industry. WSC and USDA researchers tackled the problem and came up with a lead arsenate spray program to solve it. Then lead arsenate began to build up in the orchard soils and to affect plant growth. Fortunately, DDT came along about then and orchardists were able to switch to it for control of the codling moth.

Now WSC and USDA scientists are cooperatively investigating the possibility that DDT used continuously for insect control on crops may become a soil problem, much as lead arsenate did. They've found that DDT produced the most harmful effects on the plant growth over a 5-year period of any insecticide they tested. They put the various materials on in large single applications to simulate insecticide accumulation in the soil over a period of time.

BHC, lindane, aldrin, and chlordane followed in that order. Abruzzes rye showed the effects of as little as 15 pounds technical BHC over the 5 years. Others affected during the third season from application were snap beans, sweet corn, carrots, and potatoes. All but the lowest BHC treatments gave pronounced off-flavors and off-odors in the products from the crops on that land. Apparently 60 pounds of aldrin and 75 pounds of chlordane per acre didn't have any consistent effect on yield.

At 3 ½ years after the soil was tested, approximately 50 per cent of the DDT, 14 per cent of the BHC and lindane, 15 per cent of the chlordane, and 28 per cent of the aldrin was still within the surface 6 inches.

The business of screening insecticides is a tedious one. For example, one WSC researcher has been testing the effectiveness of various insecticides for control of the cherry fruit fly. He reported that in one 6-months period he'd put some 30,097 flies through the spray chamber where he tries to kill them with the various insecticides. "So far," he reports, "our results consist of one quart of preserved flies!" Actually, this man and others

working on control of this pest have been able to set up an effective spray program based on the use of parathion at seven-day intervals following emergence of the first flies from the pupae in the ground.

Parathion has proved a good control for a number of Washington pests. Its use according to ag scientists' recommendations has kept the pea moth and aphid under control in Washington for the past 3 years. In fact, control is so good that the scientists find it difficult—and practically unnecessary— to carry on further field research on these pests.

Trouble with chemical control of insects is that apparently the insects and other bugs "toughen" up to a specific chemical and aren't affected by it. Flies and DDT are one example. A WSC entomologist also reports that on peaches the green peach aphid is no longer being controlled by malathion, parathion, and various other organo-phosphorus insecticides in certain parts of the state. And so the search is on for something that will again hold this pest in check —at least for awhile. Preliminary trials indicate that nicotine or Systox will give commercial control for the present.

Here are a few of the other pests which chemicals show promise of helping control. First, some of the stone fruit mites and aphids. Peach silver mite—promising control materials: demeton (Systox), chlorobenzilate, wettable sulfur, sulphenone, and Aramite. Cherry rust mite—a combination pre-harvest dust of TEPP and Aramite; post-harvest sprays of parathion with chorobenzilate, demeton (Systox), Sytam, 12009 and 12008, Diazinon, nicotine and soap, and OS-1808.

In control of spittlebugs in strawberries, WSC scientists report that chlordane will do the job, and that aldrin and heptachlor look even more promising. For the spruce aphid, especially on the Colorado blue spruce, they've found that lindane or malathion will do the trick.

And for slugs—a perennial problem on the west side of Washington —metaldehyde looks promising, according to experiment station workers. It's both a stomach and nerve poison. If the slugs don't die from eating material dusted with metaldehyde, it may paralyze them on contact. And if they're paralyzed out in the open, they die from the heat of the sun, since slugs have to have a moist environment to live.

Washington State College scientists also seem to be making progress in whipping another odd pest—the symphla. These primitive animals are spread throughout the world. But the first record of their doing damage of economic importance in Washington came in 1953. They cause damage by attacking germinating seeds and feeding on roots and root hairs of plants. When a damaged plant is pulled out of the ground, there is a complete absence of fine feeder roots. Usually all that remains is the stunted top root which is devoid of the fine root hairs essential for the plant's growth.

After one year's trials, horticulturists and entomologists working on the problem say that the organic phosphates — parathion, malathion, etc.—as soil treatments, look much better than the chlorinated hydrocarbons such as aldrin, dieldrin, heptachlor, etc. However, they do point out that this is just the result of one year's work and so will take some further checking on their part before they're sure of how good a job these organic phosphates will do.

The pests which chemicals are used against aren't limited to insects, by any means. For example, toxaphene has looked good as a control for mice in orchard cover crops. And now, in preliminary trials, endrin is showing up well. However, it is more expensive than toxaphene. Plans call for testing other new materials this year.

BESIDES chemicals for fertilizers and for insect control, Washington's agricultural scientists also use chemicals in weed control work. In this field, too, the Columbia Basin is coming in for a good deal of work. One of the problems is how to control weeds along the ditch banks and in the ditches. These weeds clog the ditches, slowing the flow of water and preventing it from reaching crops downstream.

USDA scientists working with the state college have found that aromatic solvents give good control of weeds in canals and ditches. The best kind of spraying equipment to use usually is that operating under the higher pressures of 100 to 400 p.s.i. The spray is put right into the water, and the higher pressures give quicker and more thorough dispersion in the channel.

Researchers say the best time to get at these aquatic weeds is before they become mature and densely massed. Effective treatments cause submersed aquatic weeds to settle to the bottom of the channel in 24 to 48 hours and to disintegrate and slough off within two or three weeks.

Used properly, solvents apparently don't hurt farm livestock. But they are deadly for fish, snails, mosquito larvae and other aquatic life. At the concentrations and rates recommended, they caused no economically important injury to alfalfa, beans, carrots, cotton, grain, sorghum, Ladino clover, lettuce Lima beans, oats, orchard grass, potatoes, sugar beets, or sweet corn. And in all but the larger canals, control by aromatic solvents cost less than did mechanical control.

Another problem in weed control work in the Basin is the use of 2,4-D. It kills weeds, but it also can cause crop injury. It is used for weed control along ditches. Could it contaminate irrigation water and thus injure crops watered from those ditches? A USDA cooperative researcher used red Mexican beans to find out. He applied 2 and 6 pounds of 2,4-D per acre in irrigation water at seedling and bloom stages.

With two pounds at seedling stage, both tops and roots showed pronounced injury. Recovery began within 16 days, and no significant yield reduction occurred. With 6 pounds at seedling stage, tops were severely damaged and the roots nearly all destroyed. Amazingly, within 3 weeks, a number of plants began to

(*Continued on Page 111*)

Fertilizer Pesticide Mixtures: A State by State Survey

Question	Yes	No
1. Are fertilizer-pesticide mixtures sold in your state?	39	10
2. Are *these mixtures* registered under your fertilizer law?	45	2
3. Do you have a law regulating pesticides?	40	11
4. Are *these mixtures* registered under your pesticide law?	32	12
5. Do you collect the regular fee under your pesticide law?	30	14
6. Do you collect the regular fee and tonnage tax under your fertilizer law?	46	1
7. Name the pesticides which are generally used in these mixtures in your state.		see text
8. Does your state experiment station recommend fertilizer-pesticide mixtures?	20	27
9. Do you limit registration and distribution of fertilizer-pesticide mixtures to those mixtures recommended by the state experiment station?	14	29
10. Have you issued regulations covering the sale and distribution of these mixtures?	11	34
11. Do you permit sale in bulk?	25	17
12. Do you permit sale in woven bags?	26	13
13. Do you require that mixtures be distributed in heavy paper containers?	12	29
14. Do you require a label showing:		
(a) Ingredient statement for both fertilizer and pesticide?	41	4
(b) Directions for use?	34	6
(c) Warning statement?	38	6
(d) Other requirements under both laws.	13	7
15. In addition to the above label, do you require a red tag bearing a warning or other statement?	8	37
16. Do you permit "buyers mixtures" or "farmers mixtures" whereby a farmer may have any pesticide added to his fertilizer by the manufacturer?	33	12
17. Are sales under 16 above subject to regulation under fertilizer and pesticide laws?	25	16
18. Do you analyze fertilizer-pesticide mixtures?	35	10
19. Have you established tolerances for deficiency or excess of pesticide?	3	43
20. Do you permit the sale of lime or gypsum mixed with pesticides?	20	19
21. Are changes in your laws now being considered?	10	34

Fertilizer—Pesticide MIXTURES

... A State by State Survey

DESPITE all the problems that have been encountered in the past few years in the field of fertilizer-pesticide mixtures, a recent survey shows that the controversial combinations are being sold in a big majority of states, although less that half of the state experiment stations recommend them.

These facts were brought to light in a comprehensive survey of the subject among control officials in the United States, Canada, Puerto Rico and Hawaii, made in April by Dr. Rodney C. Berry, state chemist of Virginia. Dr. Rodney has reported on the mixtures at control association meetings and at fertilizer and pesticide trade association meetings for several years. He used the survey as the basis for his part in the panel discussion at the combined meeting of the National Fertilizer Association and the American Plant Food Institute last month.

The situation is changing rapidly, Dr. Berry cautioned, but, at the time of the survey, F-P mixtures were reported being sold in 39 states (or countries). At the same time, control officials reported that experiment stations in 20 of the states recommend the mixtures, while those in 27 others do not.

In the areas where the mixes are being used to stimulate growth and kill insects in one operation, aldrin is the pesticidal material most often included.

Chlordane is next in popularity, with DDT, dieldrin, heptachlor and 2,4-D following in that order. Numerically, here's how the pesticide chemicals rank, according to the survey statements:

Aldrin—being used in 26 states, chlordane—19, DDT—10, dieldrin—9, heptachlor—7, 2,4-D—6, toxaphene—4 and lindane—3. There was one report each for CIPC, thiram and 2,4,5-T.

Companies in the fetrilizer and pesticide industries that are presently marketing or who plan to market F-P mixtures have found that the situation is highly complex. The survey of control officials does nothing to simplify it. Comments from the officials ranged from acceptance of the mixtures to outright dislike of them, with various shades of apprehension in between. In some states the situation is working itself out fairly smoothly, despite all the complications of toxicity, regulatory laws for both products, methods of sampling and methods of distribution.

In others, control officials have expressed their concern over the drawbacks of the mixes. A Texas official reported "we still refuse to register fertilizer-pesticide mixtures."

Between these extremes were these varied comments on the mixtures:

"Some is being used on an experimental basis by individuals. As yet, we have not received an application for sale of these mixtures (*Arkansas*).

"No fertilizer-pesticide mixtures used in Mississippi so far." (*Mississippi*).

"The experiment station neither recommends nor opposes fertilizer-pesticide mixtures. Among the reasons for this are that the most effective application of pesticides to soil generally is by broadcasting, while fertilizers are more often applied in rows. Under varying conditions, satisfactory rates of application of the two when mixed becomes a rather acute problem. (*North Carolina*).

"None for food crop use. (*New Jersey*).

"None sold for use on food crops. We register these mixtures for use on lawns and ornamentals." (*New Mexico.*)

"Sales . . . extremely small. Mostly products for use on lawns to add fertilizer and control weeds at the same time. . . . We try to follow a policy in keeping with the statement of the state experiment station:

" 'The use of insecticide-fertilizer combinations involves two problems: 1. selection of the insecticide and the rate of application necessary to do a specific job and 2. selection of the specific fertilizer formula and rate of application necessary to fulfill the nutritional requirements of the crop to be grown on a particular field.

" 'Since not all insecticides are compatible with every fertilizer formulation, and since choice and rates of application of insecticides and fertilizers vary with the specific insect, soil and crop in question, production and sale of general purpose insecticide-fertilizer combinations is not recommended. Custom mixed insecticides and fertilizers, designed to meet specific problems, are the only products currently approved!" (*North Dakota*).

One of the biggest headaches to the control officials is how to regulate the mixtures. In Dr. Berry's survey, 49 of the control officials reported that their state (or country) has a fertilizer law, while two do not. In the cases of pesticides, 40 have laws, but 11 do not. Almost without exception, states with fertilizer laws require that the mixes be registered at least under this law, while 32 of the states require registration under the pesticide law as well, with 12 states not requiring pesticide registration.

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Pink Bollworm Control in South Florida

ONE avenue of attack in the United States government's project to control, or at least impede the spread of, the pink bollworm in the cotton south, is the Wild Cotton Eradication Project, the only one in the U.S., conducted by the USDA. The Florida State Plant Board cooperates by removing or reporting ornamental cotton plants found while inspecting various premises, groves and nurseries. Since wild cotton is a host plant for the pink bollworm, its eradication is considered extremely important.

The Pink Bollworm Control Project operates in Louisiana, Texas, Arkansas, Oklahoma, New Mexico, Arizona, and Mexico. with headquarters in San Antonio, Texas. This project works to control the development and spread of the pink bollworm by quarantines and cultural methods.

No domestic cotton is grown in south Florida, although 35,000 bales are produced annually in other parts of the state. The Wild Cotton Eradication Project is of prime importance in Florida as the possibility of spread of the pink bollworm to surrounding states into high commercial acreages is an everpresent threat which must be guarded against. Headquarters of the project is Coral Gables, where W. E. Conn heads a permanent staff of 14 men engaged in the work, while during the active season, approximately sixty temporary workers and several transferred permanent employees also aid in the program.

This job involves eliminating wild cotton from a large area, comprising a sizeable portion of the Florida coast, including the Keys. Operation of the project presents an interesting study in men, materials and methods.

Small aircraft and autogiros have been used to map out areas where the wild cotton plant is spotted, much of it growing deep in the heart of the Everglades country. This data is then plotted in detail, and the program for the coming year is blocked out. The region near Cape Sable is mapped out into 58 sectors or wild cotton "locations", on tablecloth-size charts in the main office in Coral Gables. Details of water depth and topography are entered. There are approximately 900 wild cotton locations in the south Florida area. The winter season, roughly from November to May, is the dry period and is best suited for the eradication work as mosquitos make it impossible to work in the wet season.

Mr. Conn, project leader, organizes his crews, assigning eight men to each houseboat making a trip to the affected areas. Men set out from the houseboats on foot over trails that have been cut through by machetes in the previous season. These trails, just wide enough to allow one man to pass, must be reblazed every year because of the prolific growth of tropical plants. The workers are sent out in groups of two or four. It has been found by the USDA that the most economical and feasible method for eradicating the wild cotton plant is still to go into the areas on foot and pull up the plant by the roots. The plants aren't burned, although at one time it was thought necessary to do so. They are simply left to die out on the ground.

Crews of eight men per houseboat are employed in eradicating wild cotton plants in South Florida.

CMU has been used to assist in the cutting of trails and seems to do an effective job of destroying growth, especially in more open and sunny places. . . . However, it is not very effective in dense, heavily grown-over regions. Even in the successfully treated areas, healthy plant life comes back the year following treatment . . . the wild cotton plant being one of the first to appear.

A severe hurricane struck the Florida coast several years ago, flooding the area with salt water. Immediately after, it was noted that the salt water had destroyed many cotton plants in addition to much of the other vegetation. Next year, however, the wild cotton reappeared. The salt water seemed to hold back the germination of seeds, but no permanent damage was done. Consideration was given to deliberately pumping salt water into the affected areas; however, the cost of the heavy equipment needed precluded this approach.

Workers in the project systematically canvas towns and cities on the east coast of Florida in search of the wild cotton plant, as many householders keep these plants for decoration.

At times, wild cotton is found imbedded in coral rock. The Key Largo location is typical. The approach in this case is to lacerate the plant from the coral and then apply sodium arsenite to the stump.

Other plants that could act as hosts to the pink bollworm include various relatives of wild cotton such as Hibiscus, Kenaf, and other wild mallow plants; however, the Florida Station has seen no evidence of attack yet. Texas and Mexico, on the other hand, have reported that related plants are infested in these states.★★

Mixing of Superphosphate and Manure

By K. H. S. Haasies (Albatros Superfosfaatfabrieken, Utrecht, Holland) and L. J. Carpentier (I.S.M.A.). Presented at the agricultural meetings in Bordeaux on September the 21st and 22nd, 1954, at the meeting of the International Superphosphate Manufacturers' Association.

THE use of superphosphate mixed with manure is not a new practice, for in Scandinavia, Germany and particularly in the United States it has been the subject of systematic study since the beginning of the century. The Vermont Agronomic Station published in 1935 the results of several years experimental work, demonstrating the efficacy of this fertilizer in reducing the loss of nitrogen from the manure. This effect of superphosphate is generally the only one to be recognized, but it has other effects. In this respect it is seen that a manure treated with superphosphate not only conserves its nitrogen more efficiently, but its value as a fertilizer is increased due to the phosphoric acid which improves the balance of the manure. In spite of this, the practice of treating manure with superphosphate has not been widely employed.

The Role of Superphosphate

THE nitrogen content of fresh manure varies from 0.45 to 0.64%. Half of this nitrogen comes from urine, and is originally in the form of urea, which is rapidly transformed into ammonia. The ammonia has a tendency to evaporate in the atmosphere and, therefore, the nitrogen is lost. For example, it has been observed that at the end of three months, as much as 90% of the nitrogen contained in the urine has disappeared.

This loss commences gradually when the manure is moved from the cattle-shed to the storage heap, it is accentuated during fermentation, but the maximum loss occurs as the manure dries out following application to the fields (up to about 50% of the total nitrogen content of the manure is lost).

Moreover, this loss of nitrogen varies according to the climatic conditions; in particular during fermentation heat or frost accelerates the loss (17 to 50% instead of 2-12%).

Faced by this wastage of plant food, agronomists have been investigating the possibility of reducing the loss. Several methods have so far been used, based on different principles: (a) physical preventive action (covering the liquid manure with oil in the manure-pit, mixing peat or composts to the farm-yard manure) or (b) biological preventive action (adding formaldehyde to the litter to stop bacterial activity) or (c) chemical action (such as the reaction between superphosphate and the ammonia in the manure). This report is concerned primarily with the third method.

First of all we note how up to now this action of superphosphate has been explained. According to the Vermont Research Station, two reactions take place simultaneously, involving (1) calcium sulfate and (2) monocalcium phosphate:—

$$CaSO_4,2H_2O + 2NH_3 = (NH_4)_2SO_4 + Ca(OH)_2 \quad \text{(1)}$$

$$CaH_4(PO_4)_2 + NH_3 = Ca\,H\,PO_4 + NH_4H_2PO_4 \quad \text{(2)}$$

In effect, the principal reaction is attributed to the calcium sulfate, the monocalcium phosphate being only an accessory. On the other hand, the dicalcium phosphate, in the presence of the lime resulting from the reaction of the sulfate, gives tricalcium phosphate and the total reaction becomes:—

$$CaH_4(PO_4)_2 + 2\ CaSO_4,2H_2O + 4NH_3 = Ca_3\ (PO_4)_2 + 2(NH_4)_2\ SO_4 + 4H_2O$$

Since the content of available phosphate remains high, only a small amount of tricalcium phosphate can be produced, and the phosphoric acid must enter into other e.g. organic, combinations. Kreybig puts forward the theory that it is fixed by colloids. On the other hand, it may be that the superphosphate exerts a bacteriostatic effect either by itself or by changing the reaction of the manure (pH 5.5 instead of 8).

Although the action of superphosphate may not have been satisfactorily explained theoretically, practical experience has shown that manure treated with superphosphate loses its nitrogen much less rapidly than that which has not been so treated, as shown in Table 1.

TABLE I

Loss of nitrogen from liquid manure at the end of three months—(as percentage of total nitrogen).

	Loss %
Liquid manure alone	89.2
Liquid manure + 17.7 kg. superphosphate per ton of manure	70.6
Liquid manure + 35.4 kg. superphosphate per ton of manure	44.2

Thus in three months, the loss is diminished by 50%. Consequently, there is an additional amount of nitrogen available for the crop which may be calculated as 45 or 55 kg/ha, on a basis of 25 tons/ha of manure. This additional nitrogen will lead to an increase in crop yield where insufficient fertilizer is used; in other cases, the amount of fertilizer applied can be reduced with consequent financial saving.

Improvement of the value of Phosphoric Acid and of the Manure.

Field experiments with manure treated with superphosphate have shown that plants assimilate P_2O_5 as well as, if not better than, when superphosphate alone is used. It has also been observed that in ferruginous soils, phosphoric acid fixation is slowed down considerably.

In general, manure contains a little less P_2O_5 than N or K_2O and because of this the addition of superphosphate produces a more balanced NPK fertilizer.

Consequently, the superphosphate improves the fertilizing value of the manure, because to a great extent it avoids the loss of nitrogen, it balances the plant food ratio of the manure and it combines with the manure to form organic phosphate compounds analogous to those which should be formed in the soil following an application of phosphatic fertilizer.

At the beginning of this report we referred to experiments carried out in the United States at the Agronomic Research Station at Vermont, and some of the results have been cited above.

Recently, it has been shown in the United States that superphosphate in aqueous suspension reacts with ammonia to give tricalcium phosphate and ammonium sulfate. Therefore in order to limit the formation of tricalcium phosphate, which is not readily assimilable, the mixing must be done before the urea is converted into ammonia.

In Sweden, O. Franck has investigated the evolution of the reaction between the urine and superphosphate. The considerable displacement of CO_2 lowers the pH value from 8.3 to 5.8, and O. Franck estimates that this acidification inhibits the activity of bacteria.

In Germany, Sauerlandt and Doerell have carried out experiments in the field with treated manure. The yields of sugar beet obtained have shown an increase of 30% over those from fields treated with ordinary manure.

In South-Eastern France similar experiments have been undertaken in 1954. The manure keeps well and has a good appearance. It will be used for field tests in 1955, but at present, it is impossible to give figures regarding the chemical composition of this manure and its efficacy.

In Holland, experiments have been carried out since 1953 on a dairy farm with 200 barn-fed cows.

Samples of manure have been taken periodically and analysed in order to determine the total content of N, P_2O_5, K_2O and CaO.

In general, the treatment leads to an enrichment of the nutritive elements, not only of the nitrogen, phosphoric acid and calcium, which is to be expected, but also of the potassium.

However, the experiments which have been carried out up to now have not been conducted in a sufficiently systematic manner to allow any definite and valuable conclusions to be drawn. Further experiments of longer duration will have to be followed up in a more conclusive manner.

Methods, Rates of Application

It is possible to employ four different methods, which we will examine in turn in order to see their advantages and disadvantages.

1. Spreading of superphosphate in the cattle-shed

There are two possible methods of mixing, either on the litter straw or in the gutter with the liquid manure. The second method is the only one, in the case of sheds with short standings, which does not require straw as litter. In this case, the excreta fall directly into the gutter and come immediately into contact with the superphosphate.

If, on the contrary, the shed consists of long standings on which it is essential to place a layer of a straw litter, it is recommended to spread some shovelfuls of superphosphate on the litter which absorbs the urine. This does not dispense with the need to put a little in the gutters.

Finally, in the case of animals in yards, that is to say continually on straw litter partly decomposed and rarely changed, it is essential to spread all the superphosphate over the litter.

Advantage of this method—the superphosphate comes into immediate contact with the manure and therefore the loss of nitrogen is minimized.

Disadvantage—the superphosphate is liable to cause slight irritation to the cow's feet, and there is also a risk of obstructing the liquid manure drains.

2. Spreading the superphosphate on the manure heap

After each new addition of manure to the heap, a thin layer of superphosphate is spread.

Advantage—Irritation to the cows' feet is avoided, and the loss of nitrogen during fermentation is reduced to a minimum. No risk of drain obstruction.

Disadvantage—In this method the manure has already been left exposed for a time before the superphosphate is added, and therefore a certain amount of ammonia forms and escapes.

3. When the manure leaves the farm for the fields

When loading the manure carts each layer of manure is covered with a layer of superphosphate.

Advantages — These are the same as in the previous method.

Disadvantages—As the mixing takes place so much later, fermentation has already taken place and a great deal of the nitrogen is lost. Also, when the manure is drying on the field, the ammonia continues to evaporate, because the mixture has not had sufficient time to react.

4. Mixing in the liquid manure tanks

This method can be carried out in association with the two previous methods.

Advantage — This method avoids the possibility of obstructing drains, and loss of nitrogen from the liquid manure.

Disadvantage — This method alone is not sufficient, because the solid manure is not treated with superphosphate.

Discussion

THE third method presents great disadvantages and must be rejected. The second method is of more value but necessitates two separate operations—mixing with the stable manure, and mixing with the liquid manure. In the case of short standings, it is preferable to spread the superphosphate in the gutters as long as the drains are of sufficiently large diameter to avoid blockage.

With cattle in yards, it is necessary to avoid bringing the animals' feet into contact with the treated manure. For this purpose, it is sufficient if the superphosphate is spread over the manure each day before adding fresh straw. From time to time a small amount of liquid manure should be added.

The applications of superphosphate frequently recommended are as follows:—

0.5 kg per animal per day where more than 20 tons/ha manure are used.

1 kg per animal per day in other cases or 15 to 30 kg of superphosphate per ton of manure.

5. Importance of this method

In view of what has been said above, if all users adopted this technique, the consumption of superphosphate would be considerably increased in those countries where other phosphatic fertilizers are used in competition with superphosphate. No other phosphatic fertilizers are suitable for this purpose and there would consequently be a new outlet created of possible importance for superphosphate.

In more backward countries, pastures are not usually given fertilizers. They receive only one application a year of liquid manure.

By mixing superphosphate regularly with the liquid manure, the latter is enriched in nutritive properties and at the same time the phosphorous deficiency of the soil is reduced. Moreover, this practical method does not involve additional operations and does not, therefore, increase costs.

Assuming that only a small number of people adopted this method, an increase of from 10% to 20% of superphosphate consumption in any one country can be envisaged.

It follows that 10% to 20% of the demand for superphosphate would be evenly spread over the year and consequently would lead to a lessening of the fertilizer peak period.

Conclusion

The foregoing leads to the conclusion that there are two main advantages to be had from the mixing of superphosphate with manure:—

1. *Agronomic*

Better conservation of the manure or liquid manure, application of a better balanced organic manure. All the chemical analyses of manure treated with superphosphate show a considerable increase in the nitrogen content. The phosphoric acid is applied to the soil in the form of easily assimilable phospho-organic compounds. By enriching the manure in P_2O_5, the N P K balance is improved. All these factors prove that the superphosphate increases the value of the manure, and thus at the same time improves the physical structure and fertility of the soil.

2. *Economic*

Increase in the consumption of superphosphate, better distribution of deliveries. These advantages must be taken into consideration by superphosphate manufacturers, since as well as being advantageous from the agronomic point of view, it opens up a new and continuous prospect of constant demand.★★

•

Chicago Garden Show

Plans for the fourteenth Midwest Garden Supply Trade Show, to be held Jan. 17-19, 1956, at Chicago, were announced recently. In addition to the displays of gardening equipment, garden products and supplies . . . service and repair clinics, forums on marketing problems, conferences of manufacturers and dealears will complete the program.

The Chicago show will be the second in the current series, the first to take place in Oakland, Calif., Sept. 13-15, 1955, and the final show to be held in New York city Feb. 7-9, 1956.

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New Policy Statement Issued Regarding Miller Bill

By Charles E. Palm

A NEW statement of policy has been announced by the Food & Drug Administration in the *Federal Register* of June 10, 1955, regarding the fully effective date of the pesticide amendment as it relates to the establishment of tolerances or exemption from tolerance requirements for pesticidal chemicals. This statement of policy is extremely gratifying to many of us, since it may make possible the use of a number of valuable pesticides, which are currently label-accepted, for the remainder of the 1955 growing season.

Prior to this new statement of policy, July 22 would have been the final date for getting a tolerance or exemption established for a pesticide if it were to remain in legal use on raw agricultural commodities that enter inter-state commerce. Such a requirement would have been essential to continue registration. Many states were continuing products in recommendations with the hope of approval before the final date, but at the same time were prepared to remove them from recommendations if necessary.

Under the new policy just announced, "the Secretary of Health, Education and Welfare may extend this date on a product -by-product basis for a time not to exceed 12 months on a finding that conditions exist that necessitate the extension of such additional period." In providing for careful consideration to each product, rather than allowing a blanket extension, the protection of the public health is kept paramount. The statement further indicates "there should not be an extension of the effective date of the amendment for uses of pesticide chemicals for which tolerances have already been established."

The Department, in announcing its policy, states, "that extensions beyond October 31, 1955 would lead to confusion in 1956." It recommends that States prepare spray schedules for the 1956 growing season" which direct (1) pesticide uses that leave no residues at time of harvest or (2) the use only of pesticides for which tolerances have been established or exemptions granted under the Food, Drug and Cosmetic Act."

The Secretary expressed the basis of her policy for establishing procedures for considering requests for an extension of the effective date of the law for specific pesticides as follows: "Numerous tolerances for residues of pesticide chemicals,—and some exemptions from the requirement of a tolerance,—have been established. However, tolerances or exemptions have not been established for some pesticide chemicals that are employed in agriculture, and it is not possible at this time to determine whether tolerances will be established for them before the end of the current growing season. Some of these pesticides have been recommended by certain State officials for use on crops throughout the 1955 growing season. Agriculturists, pesticide manufacturers and distributors, and food-law enforcement officials need to know the status of these pesticides under the amendment prior to July 22, 1955, so that they will know whether the pesticides should be employed throughout the 1955 growing season." The criteria and precedures for obtaining an extension are given in detail and it is hoped will provide industry with the needed information on which to file requests for extensions in time to get decisions prior to July 22.

I feel confident that all of us concerned with extension recommendations in the states appreciate the statement of policy and the cooperation extended by the Food and Drug Administration toward making possible a minimum of confusion in pest control recommendations in 1955, yet at the same time giving ample consideration to the public health by taking each product into consideration in determining an extension.

Residue Research Looms Important

As we approach mid-season in many parts of the country, we find that most experiment stations and many of the industrial laboratories are in the midst of research programs in the field upon the results of which they will base their judgments as to the performance of pesticidal chemicals. With their legal requirements that now face the industry regarding performance data in terms of effectiveness of new chemicals, as well as the residues that may be expected at harvest, it is obvious that in many institutions, the facilities for residue data are weak. This is easy to understand when one recalls that only a decade ago the introduction of a wave of new organics began and most investigators tried every means to keep abreast of their field evaluation studies. In the case of certain pests, including the housefly, various aphids, several species of mites, the Colorado potato beetle, cabbage worms and the like, development of resistance to pesticides further complicated the picture, and added even more pressure for field evaluation of all candidate insecticides.

It soon became obvious that pesticide residues would become an important facet in the picture of registration and ultimate use by growers of those chemicals that proved effective in field experiments. The Hearings in 1950 pointed out this fact, but the delay in announcing tolerances and the subsequent Hearings conducted by the Delaney Committee left us without the direct impetus that passage of the Miller Bill

has now provided. Now we have tolerances on a large number of pesticides covered in the 1950 Hearings, and the provisions of the Miller Bill indicate that henceforth residue data at harvest will assume an important role, along with other factors, in de-

(*Continued on Page* 100)

Problems Arise for Insecticide Researchers In First Season's Experience with Miller Bill

UNEXPECTED problems have been encountered by research workers in the pesticide field this season as they have had their first experience with application of the new Miller Bill. It has been anticipated that provisions for the setting of temporary tolerances for new experimental pesticide materials would allow necessary experimental work to go forward unimpeded; however current experience, on the basis of reports received, seems to indicate that officials of the U. S. Department of Health, Education and Welfare are tending to view the requirements for the establishment of such temporary experimental tolerances as about as stringent as those for the setting of permanent tolerances.

Some commercial pesticide workers who have had recent contacts with HEW officials express the opinions that the experience of the department with the Salk antipolio vaccine program has tended to make them super cautious. The general atmosphere in Washington and elsewhere, they say, is that, perhaps understandably, no official charged with responsibility in a health matter wants to take the chance of sticking his neck out even a millimeter. There is a feeling that the timing of the Salk situation has had unfortunate consequences for those concerned with experimental work on pesticides.

It seemed obvious to the pesticide industry, and particularly to those charged with responsibility for testing new pesticide materials, that provision must be made for testing new products; and it had been thought that the Miller Bill itself, through the provision for setting of temporary tolerances, took care of this situation. It had been anticipated, however, that a more liberal attitude would be taken toward setting of tolerances on materials used experimentally than for materials for commercial use. If, however, the department is making little differentiation between experimental and commercial usage, it seems quite apparent that future experimental testing programs, at least those requiring large scale field data, will face serious obstacles.

With pharmacological testing so costly a part of research work, and with the developers of these new materials not having unlimited budgets to spend in this direction, an insistence on having complete experimental findings presented before even temporary tolerances will be granted could simply mean that many new products, perhaps safer than those presently in use, or effective in safer dosages, will never get out of the laboratory into field work.

At the same time it is recognized that FDA cannot stretch the law to the point where public health might be in danger. To let treated produce go into consumption with no evidence as to residues or toxicology would be directly contrary to the Miller Bill.

At one eastern university where much experimental test work has been conducted in past seasons, a temporary answer to the problem has been found, for this season at least, in a program in which the university will buy from farmers all produce treated with new experimental materials, for subsequent destruction. Admittedly such a program is not a feasible nor a desirable long-run solution to the problem, and the arrangement is being made solely as an emergency measure this season, in order to be on the safe and conservative side amid the present confusion and controversy over the new law and its interpretation. This purchasing and destroying of crops, treated with experimental materials for which tolerances have not yet been set, is of course, a costly procedure. It will greatly limit the amount of field work that can be done, as well as the size of individual experimental plots.

In the view of at least one prominent and well qualified research worker in the pesticide field, the Department of Health, Education and Welfare is perhaps exhibiting too strong a preoccupation with the subject of the hazard from toxic residues, and insufficient concern over application hazards. This authority points out that to date not a single case is known where pesticidal residues in or on a farm crop, resulting from application of a pesticide under normal field conditions, have been proved to have adversely affected a human being, let alone having killed anyone; whereas quite a few fatal accidents and a large number of nonfatal poisonings unfortunately occur in the course of handling and application of pesticides.

This raises the ominous prospect for users of pesticide products that, if such a policy becomes definitely established, American farmers may before too much longer be left with only a very few pesticides other than highly poisonous ones. While they may have the department's blessings on their use so long as they do not leave toxic residues on food crops, development work on less toxic materials, in the U. S. at least, may of necessity be partially suspended. A better balanced view of the "application vs. residue hazard" is recommended to officials of the Department of Health, Education and Welfare by this authority.

It is pointed out in defense of the Food and Drug position on this point, however, that their prime responsibility is the food,—not the operator.

At the moment the situation can well be described as distinctly confused. And there is little evidence that the confusion will be eliminated even by the 1956 growing season.★★

Critics of TVA Fertilizer Role

PRODUCTION of fertilizer by the Tennessee Valley Authority in competition with commercial fertilizer manufacturers has come under strong attack in the course of the past few weeks in a renewal of the controversy which has ranged through government and industry circles since the TVA fertilizer program was set up a little over tweny years ago. First gun in this most recent resumption of hostilities was fired a little over a month ago when the Commission on Organization of the Executive Branch of the Government (commonly known as the Hoover Commission) recommended 1) that the TVA discontinue all chemical research 2) that TVA fertilizer research facilities be transferred to the Department of Agriculture and 3) that the comptroller general be instructed to determine what the real costs of TVA production are and that thereafter the price of such fertilizer include all costs, direct and indirect, including the loss of taxes which could be obtained from private industry.

Subsequently, on May 27th, Richard E. Bennett, president of Farm Fertilizers, Inc., Omaha, Neb., and of Bennett Chemical Co., Denver, Colo., appeared before the House Subcommittee on TVA Appropriations, and entered a strong protest against the TVA competing with commercial fertilizer manufacturers in production of diammonium phosphate. He indicated in his testimony that TVA is selling diammonium phosphate at a price ($103.32 per ton f.o.b. Sheffield, Ala.) which is almost exactly equal to the cost to commercial producers of the raw materials alone, excluding freight charges on the raw materials. He indicated that the product is currently being produced by one company in Michigan, one in Illinois, two in Colorado and two in California, none of whom would find it possible to operate except at a loss in the face of TVA competition.

Mr. Bennett observed that TVA is preparing to produce a capacity of 40,000 tons annually of diammonium phosphate. They state that production of private plants will be between 30,000 and 40,000 tons in 1955. A TVA output of this size, he charged, "can scarcely be considered experimental or educational." He also disagreed with TVA estimates as to current commercial production, indicating his own belief that 12,000 tons of diammonium phosphate annually is approximately what private industry is now selling. As to the future potential of this market, which TVA has forecast may be in the neighborhood of "several hundred thousand tons annually," Mr. Bennett observed that such a prediction is "fantastic," although the potential future market is of course far above its present size. He indicated his strong belief that "the commercial fertilizer industry can develop this market in a very satisfactory manner if they are not faced with this ruinous competition from TVA."

Reviewing his previous protests to TVA against their entry into the production of diammonium phosphate on such an extensive basis in direct competition with private enterprise, he testified as follows:

"When I heard in January of this year that the TVA was planning to go into production of diammonium phosphate on a commercial scale, and sell at a price which was ruinous to private industry, I called to the attention of the TVA that in my opinion there was no need for TVA to expand their facilities in order to manufacture this product which they had *not* manufactured before. I called to their attention that six private plants were already in production and had capacities to produce much more of this material than there was a market for. I asked for the opportunity to meet with the officials of TVA and talk this matter over with them, because I knew that if they went ahead with these plans at the prices which had been mentioned, it would mean Bennett Chemical Company would be *ruined* and would have to discontinue the production of this product and go out of business.

"I met with a representative group of TVA officials from Knoxville and from Sheffield in February. I was told then by them that their decision to manufacture this product had not yet been firmly set and that their policy and prices were still to be determined.

"At this meeting, representatives from Colorado Fuel & Iron Company, along with my son, who manages Bennett Chemical Company and myself, brought to the attention of the TVA that the needs for diammonium phosphate were now being met by private industry, that the entering into this new production by TVA was not needed on an experimental basis, an educational basis or on any other basis because industry was prepared to furnish this product at reasonable prices and to develop the market through agricultural colleges, county agents and thousands of dealers and farmers, so that the agronomic advantages in the use of this product would be fully demonstrated.

"We also called to the attention of the TVA at this meeting that if they produced and sold diammonium phosphate at the prices we had heard mentioned, it would be absolutely ruinous to us and would discourage rather than encourage the production of this material by private industry. I told TVA that Bennett Chemical Company would definitely be ruined if they took this step. At this meeting the TVA men practically told us that our costs were too high and that no one had a place in the industry, unless they manufactured their own phosphoric acid and their own anhydrous ammonia, at the same location where they were manufacturing diammonium phosphate. I called to the attention of the TVA representatives at this meeting, that if this was the case, then 95% or more of private industry in all lines had no business being in business, because there was only a very small per cent of any manufacturers who pro-

cess all of their raw materials and pay no freight on any of them.

"Since this meeting in February, TVA has received protests probably running into the hundreds from congressmen, senators, fertilizer manufacturers, trade associations, the Hoover Commision, the Bureau of the Budget, Secretary of Agriculture Benson and Secretary of Commerce Weeks, protesting their entering into the manufacture of this new material. These protests have called to the attention of the TVA that this is the first time TVA has ever manufactured a fertilizer which contains both nitrogen and phosphorus. These protests have called to the attention of TVA that industry knows how to produce diammonium phosphate and that sufficient agronomic research has been carried out to demonstrate its usefulness on crops. These protests have said that TVA's entering into this production would discourage this development by private industry.

"At a recent meeting of the Nebraska Fertilizer Institute, which is composed of a large number of fertilizer dealers and a small number of fertilizer manufacturers formed for the purpose of promoting fertilizer use in the State of Nebraska, a resolution was unanimously passed that in producing diammonium phosphate on a commercial basis, the TVA was establishing a very serious precedent in the fertilizer industry and was hurting the industry rather than helping same. It was unanimously voted that the organization do everything in their power to bring to the attention of our Government the serious mistake that was being made in permitting TVA to go into further active competition with private enterprise.

"To all of these protests, TVA has turned a deaf ear and apparently they are determined to go ahead with this project in spite of these many protests.

"TVA says that their distribution is for experimental and educational purposes and that the requirements which they place on the distribution and use of their fertilizers confine them to educational and demonstration programs and avoid direct competition with commercial producers. This is just so much apple sauce or bunk. They are very substantial producers of phosphorus and nitrogen bearing materials in direct competition with private enterprise at a price at which private enterprise cannot compete and they are doing this at the cost of the taxpayers."

TVA Presents Its Case

BATTLING back in defense of its 22-year record of fertilizer research and education of the country's farmers in intelligent fertilizer usage, Dr. Harry A. Curtis, Director, Tennessee Valley Authority, stated his case for TVA in an address to the Kiwanis Clubs of the Muscle Shoals, Alabama region delivered June 8th. He recalled that the fertilizer provisions of the TVA act of 1933 listed the overall purpose of the act as being "to benefit farmers and agriculture in general; more particularly, the purpose is to develop and introduce better and cheaper fertilizers and improved ways of using them."

A report was received, as members of the NPFI met at White Sulphur Springs, W. Va., June 15th, that the House Appropriations Committee had taken action which would limit production of diammonium phosphate by TVA to 5,000 tons a year.

The TVA Board was authorized to work with farmers, farm organizations, and others in the introduction of new forms of fertilizers and in establishing new fertilizer practices. It was authorized further to sell or to give away fertilizers in order to accomplish the over-all objectives of the program. The Board, he recalled, arrived at an early and very significant decision which was that "TVA should not undertake large scale production and competitive commercial sale of fertilizers. Rather it's efforts would be directed toward the education of farmers in the value and effective use of fertilizers, toward the development and small scale production of new and better types of concentrated fertilizers, and toward the introduction of these improved fertilizers in readjusted farm practices."

It was anticipated, Dr. Curtis recalled, that the over-all result of these efforts would be the creation of demand for the improved fertilizers, and that the commercial fertilizer industry would be quick to take advantage of the situation.

Since the immediate need at the time, in the opinion of those directing the TVA fertilizer program, was for phosphatic fertilizer at the lowest possible price to the farmer, TVA decided that its initial program would be concentrated on the production of phosphatic fertilizers. They pioneered the development of concentrated superphosphate, beginning manufacture of the material on a small scale, using an electric furnace method rather than the conventional sulphuric acid method. Their decision to use the electric furnace method was based on the fact that by this method, (1) elemental phosphorus, an important material needed in national defense, is formed as an intermediate product. (2) Elemental phosphorus could be used to produce several other concentrated phosphatic fertilizers in addition to concentrated superphosphate and (3) that use of the electric furnace method would greatly expand the useful reserves of natural phosphate ores. He recalled that during World War II, TVA supplied 60% of the army's phosphorus requirements and again, in 1950 during the Korean hostilities, TVA supplied all the army requirements of phosphorus for approximately a year.

Drawing an apparent parallel with the current controversy on the diammonium phosphate program, Dr. Curtis recalled that back in 1934-35 when the TVA began its production of concentrated superphosphate, some fertilizer manufacturers protested at the time that TVA production was greater than market demand. Over the years, however, a demand for concentrated superphosphate has been developed among American farmers, and a larger market has been built for all fertilizers. The fertilizer industry, he believes, was certainly benefited by the expanding market for its products. The commercial industry is now producing about a million tons per year of concentrated superphosphate as compared with the seventy thousand tons which it produced and could not sell as such in 1933. So far as the concentrated superphosphate program is concerned, said Dr. Curtis, the TVA now considers its job is done and is gradually withdrawing from the field.

Recalling another similar experience with a new fertilizer material, Dr. Curtis noted that in 1935, TVA research personnel came up with a fertilizer that was new to both industry and agriculture,—calcium metaphosphate containing 62% of active plant nutrient. TVA built a small experimental production unit and the new fertilizer was included in its test-demonstration program. Development of satisfactory production equipment proved to be a long and difficult problem, however, and only recently has TVA solved this problem. It now seems likely that a commercial plant will be built to make this material and when this happens, Dr. Curtis indicated, TVA will once again consider that its job in connection with calcium metaphosphate has been completed.

TVA's original educational program,—the Unit-Farm Test-Demonstration program— was originally launched in 1935. Test-demonstration farms were selected in various localities in consultation with local county agents and in return for the farmer agreeing to keep open records of costs and to allow his neighbors to observe results obtained on his farm, he was given the inducement of limited amounts of free fertilizer for use on pastures and in other soil conserving practices. In the past twenty years, some sixty-nine thousand farmers have participated for various periods in the test demonstration programs. Today, there are some twenty-three hundred active test-demonstration farms operating in twenty-one states. However, under the present set-up, farmers on these farms now pay a part of the market price for fertilizer received from TVA.

As an indication of how such government aid programs tend to keep growing, once started, Dr. Curtis's comments on changes in the TVA fertilizer program following World War II are rather illuminating. The original intent of TVA, he noted, was to build production units only large enough to supply the test-demonstration program. However, during World War II, TVA's facilities were expanded and as a result of these additions to productive capacity, TVA found itself at the end of the war with production facilities for phosphorus and ammonium nitrate far in excess of the needs of the test demonstration program. At the same time, due to a huge increase in demand for all fertilizers, a shortage had developed throughout the country.

In the new situation, TVA introduced a plan called their educational sales program to supplement the test-demonstration program. In the educational sales program, TVA confers with the agricultural colleges, USDA representatives and TVA fertilizer distributors in the several states as to possible new and better ways of using fertilizers, the objectives being to obtain farmer acceptance of improved fertilizer practices, to increase the farmer's knowledge of fertilizers and their effective use, and ultimately, to increase the economic use of fertilizers. The program is also designed to help fertilizer dealers and distributors in developing effective educational programs in cooperation with the land grant colleges and other agencies, to devise new methods of distribution, to encourage upgrading of the plant nutrient content of fertilizer mixtures, and in other ways to lower the cost of fertilizer to farmers.

Initially, TVA contracted only with the farm cooperatives as distributors in the new educational sales program. Later on, however, a number of commercial companies were added to the group operating under the educational sales program. The test-demonstration program and the educational sales program now absorb practically the total TVA output of fertilizers, with by far the major part now going into the latter program.

Drawing another apparent parallel with the current controversy over diammonium phosphate and TVA's plans to produce it in competition with private industry, Dr. Curtis recalled that several years ago experimental work was undertaken by TVA on the manufacture of nitric phosphate. Representatives of the fertilizer industry opposed TVA's announced plans to set-up a plant to furnish the material for use in its test-demonstration and its educational sales programs and the argument was advanced at the time that a dozen or so private companies were about to build plants to produce this material. Their protests resulted in a decision to stop TVA from setting up its proposed plant. However, since that time, Dr. Curtis noted that only one of the commercial producers has actually gone into production on this material.

As for the material under most immediate current discussion,—diammonium-phosphate, Dr. Curtis indicated that the TVA objective is to get this new fertilizer into wide use from "properly located" commercial plants. TVA's position is that it has priced its diammonium phosphate in the educational sales program not with respect to its own low cost of production but at a price at which a properly located commercial plant could sell profitably. This question of just what constitutes a "properly located" commercial plant seems to be a critical one in the current contro-

(Continued on Page 104)

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WASHINGTON *Report*

by
Donald G. Lerch
Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

YOU can make your own odds but the chances are you'll be investing your company's fertilizer and pesticide money in a farm market operating under flexible price support in 1956. It's a good bet that this condition will face you for at least one full year—despite Congressional rumblings for a switch.

This means that Secretary Benson can set the support price for corn, cotton, wheat, rice and peanuts anywhere between 75 percent to 80 percent of parity. This year, on a sliding scale, they can go down only to 82½ percent of parity.

The reason that it looks as though flexibility will have at least one full year of operation is that there appears to be no chance Congress could override a presidential veto of a "back to rigid price support" Congressional measure. Harold Cooley's victory in the House has given rise to some speculation that flexible supports will never reach a farmer's field. Mr. Cooley (D-N. C.) is chairman of the House Agricultural Committee. Yet, it just isn't in the cards for an Eisenhower veto to be overridden.

The president is committed to support his secretary of agriculture and Benson is bound and determined that flexible price supports will go into operation and be given a fair chance. His whole term of office in the Department of Agriculture has been dedicated to this objective, with every action and speech in accord with it. To change now would mean loss of groundwork.

On the face of it, this seems to forecast even lower farm income. However, that is not necessarily so. There are arguments on both sides of the question. Fundamentally, the Republicans are favoring the flexible supports with the Democrats fighting for an immediate return to 90 percent rigid supports for all basic groups.

Stripped of politics, non-supported farm commodities have a higher price percentage of parity than the basics which have been supported at 90 percent. Virtually all our surplus, amounting to $7.5 billion, are in high supported commodities. For the most part, producers of the non-supported commodities—beef cattle, fruits and vegetables, hogs and poultry—have done a better job of adjusting production to demand than have growers of high supported groups.

None the less, ⅓ of the farmers —half a million of them—have a cash income of under $1,000 a year. Total farm income has dropped 25 percent in four years.

* * *

Those are some of the economic reasons why some manufacturers are having difficulty making a profit or preventing losses, depending on the individual company's position. One company we talked to reports a sales boom and its profit and dividend picture is most attractive. A number of other companies have a history of good years broken by conditions in the 1954-55 season.

In general farmers have not "poured" on more fertilizer simply to compensate for acreage restrictions. Many have tended to reduce production in line with acreage reductions. In addition to declining farm income and an uncertain farm outlook, the specter of drought is credited with curtailing further the usage of agricultural chemicals.

The situation is spotty with notable increases being recorded side by side with sizable declines. Company records show considerable variation also.

However, there is every reason why fertilizer consumption should push forward. Basic fact is that farmers use only half as much fertilizer as agricultural experiment stations say is profitable. Furthermore in the field of pest and weed control we've really only begun to demonstrate the tremendous increases in yields and income which are possible through an effective control program.

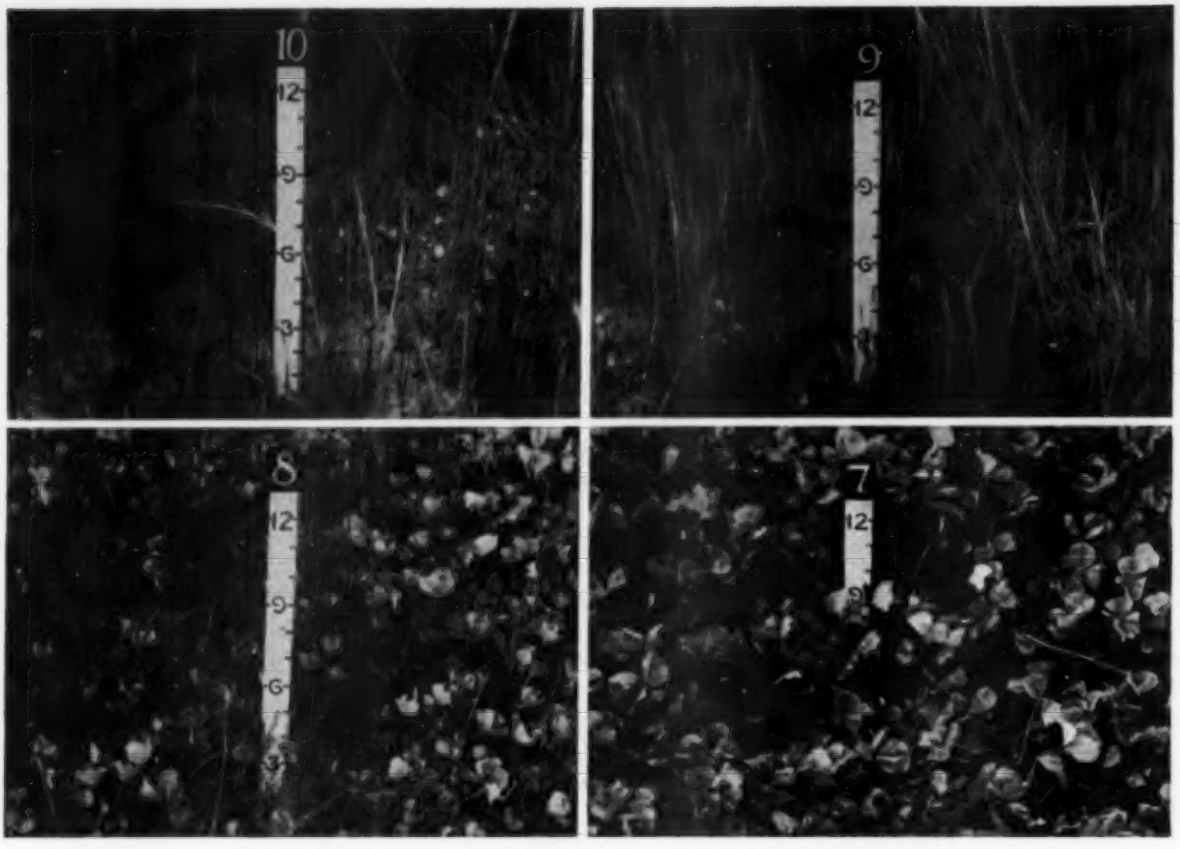
There's a big premium on sound management with emphasis on salesmanship. New faces in new positions are showing up because of the mergers and consolidations. The test will be to keep the agricultural usage curve pushing upward. Many industry leaders are confident it can and will be done.

* * *

The immense job of coordinating the actual operation of residue tolerances is being felt by the Food & Drug Administration. The job not only is one of reading the letter of the law but it involves the very delicate balance between state and federal authorities and the very touchy question of state agricultural relations. Even USDA handles state agricultural leaders with great respect. Because of its position as a "policeman" the Food & Drug Administration's problem is perhaps even more difficult.

None-the-less, the agency is attempting to interpret the Miller Amendment so that the fewest possible number of state pesticide recommendations would cause the growers who follow them to be in violation

(*Continued on Page* 105)



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How Moly reduced lime dressings to 1/10 ton an acre

In these test plots, A. J. Anderson and D. V. Maye* showed that treating a highly acid soil (pH 4.6-4.9) with traces of moly reduced lime requirements to only 1/10 ton an acre.

PLOT 10 — **CONTROL.** With only a basal dressing of superphosphate no clover could be established.

PLOT 9 — **MOLYBDIC OXIDE 2 OZ. AN ACRE.** Molybdenum alone was not effective in improving yields.

PLOT 8 — **LIMESTONE 1/10 TON AN ACRE.** Liming gave some improvement even at this low rate, but much heavier dressings were needed for good yields.

PLOT 7 — **MOLYBDIC OXIDE 2 OZ. AND LIMESTONE 1/10 TON AN ACRE.** When traces of moly were added, light liming increased clover yields ten-fold over the control.

*Austr. J. Agric. Res. 3, 95-110 (1952).

MAS-10

CLIMAX MOLYBDENUM

Technical SECTION

Walnut Infestation Checked in Southern California

DDT (50 per cent wettable powder) applied by air carrier-type equipment at the rate of three pounds per 100 gallons has been effective in controlling the codling moth in walnuts in southern California. Side problems arising from the use of DDT must be considered in the control program; an abnormal increase in the population of spider mites and the walnut aphid can be expected following DDT treatment. Addition of a miticide to the DDT-codling moth spray is effective where the European red mite is a problem.

Seasonal control of the walnut aphid can be obtained with the systemic insecticide, schradan.

Chlorthion is not very effective in controlling the codling moth but does have a marked effect on the European red mite and aphid populations. Diazinon has shown promising results in controlling codling moth; about as effective as the DDT treatment and is highly toxic to adults of the European red mite and the walnut aphid.

The first application of a two-treatment program should be made before May 10 and the second treatment three weeks later.

If the basic lead arsenate treatment is used, it should be applied at four pounds per 100 gallons by air carrier-type or conventional high pressure spray rig, at the rate of 800 gallons per acre.

Recommended dosages for combination codling moth, European red mite, and walnut aphid control are: DDT—50 per cent wettable powder, three pounds per 100 gallons for the codling moth; systox-21.2 per cent emulsifiable, 8-12 ounces / 100 gallons, or Ovotran, 50 per cent wettable powder, 1½-2 pounds / 100 gallons, or Aramite, 15 per cent wettable powder, ¾ pounds / 100 gallons, for European red mite; and parathion 25 per cent wettable powder, 1-1½ pounds / 100 gallons, or malathion, 25 per cent wettable powder, 1-1½ pounds / 100 gallons, or TEPP, 20 per cent, 8 ounces / 100 gallons, or nicotine sulphate, 40 per cent, 8-12 ounces / 100 gallons, for the walnut aphid. J. C. Ortega, "Codling Moth Control Sprays," *California Agriculture*, May, 1955.

•

Fertilizer, Soil Moisture Effects

Increases in the yield of wheat ranging from 0.9 to 9.6 bushels per acre were reported even under conditions where soil moisture seriously limits the growth of the crops. In the majority of trials made by experiment stations in North Dakota on the effect of fertilizers upon yield of wheat and soil moisture remaining in the soil profile after harvest, the moisture remaining in the soil profile after harvest was about the same in fertilized and non-fertilized plots. Fertilizer did, however, advance the maturity of the wheat which resulted in corresponding earlier withdrawals of moisture from the soil profile.

Fertilizers used on fallow: 100 pounds per acre of 0-43-0 or its equivalent drilled in with the seed. Fertilizers used on non-fallow: 100 pounds per acre of 22-40-0 drilled in with the seed. *Bimonthly Bulletin*, North Dakota Agricultural Experiment Station, Vol. XVII, No. 4, March-April, 1955.

New Soil Test for Phosphate

Using sodium bicarbonate solution to extract the soil phosphate, a new soil test that tells the amount of phosphorus in the soil available to crops has been developed by U.S.D.A.

Application of the test for determination of the phosphate needs of cotton grown in the San Joáquin Valley has been one aspect of a comprehensive cotton fertilization test program conducted during the past four years. The bicarbonate test is considered the most reliable and most easily applied diagnostic guide in cotton fertilization. D. S. Mikkelsen, "Cotton Phosphate Fertilization," *California Agriculture*, Vol. 9, No. 1, p. 7.

•

Nitrogen Spray Not for Corn

Recently completed tests by the University of Illinois show that it is neither practical nor economic to fertilize corn by spraying liquid plant food on the leaves. Tests were conducted using 40 pounds of elemental nitrogen sprayed on corn leaves and compared with plots where 40 pounds of nitrogen in a dry form side-dressed the corn. Yields were higher on plots where the fertilizer was side-dressed. Also, in one case, corn leaves were burned when spray application was made. *Cyanagrams*, Vol. 4, No. 5, Spring, 1955.

•

V-C 13 Deadly to Nematodes

A new compound, V-C 13 Nemacide, is reported to successfully combat nematodes without destroying plant life in the infested area. The new chemical, a phosphorus compound, is an insoluble liquid formulated as an emulsifiable concentrate and applied as a water emulsion. The nematocide is sprayed or sprinkled on the infested area and soaked into the soil with additional water.

Applied to turf and ornamental plants at the rate of 125-250 pounds per acre of the 75 per cent emulsifiable concentrate, good control of nematodes has been gained. Commercial production is underway at the Charleston, S.C., plant of Virginia-Carolina Chemical Corp., *V-C News*, March-April, 1955.

Literature Available

AUTOMATIC REPORTING SYSTEMS. Illustrates and describes a proportioning system that permits remote dialing of individual ingredients in formulating processes. Bulletin 0351, Richardson Scale Co., Clifton, N. J.

BOLL WEEVIL AND BOLLWORM CONTROL WITH INSECTICIDES, by F. A. Fenton, J. R. Dogger and G. A. Bieberdorf. Reports results of five years of tests with 14 sprays and dusts. A two page summary lists the insecticides with tests results and recommendations for their use. Bulletin B-441, Agricultural Experiment Station, Division of Agriculture, Oklahoma A. & M. College, Stillwater, Okla.

ADVANCING AGRICULTURAL HORIZONS THROUGH RESEARCH. The 67th annual report of the University of Maryland Agricultural Experiment Station, containing accounts of research and experiments conducted during the fiscal year ending June 30, 1954. Bulletin A-81, University of Maryland Agricultural Experiment Station, College Park, Md.

SOIL STRUCTURE STUDIES WITH SYNTHETIC CONDITIONERS, by R. B. Alderfer. Studies of the influence of structure on the yield of agricultural crops, using different types and amounts of synthetic conditioning materials, were conducted in 15 separate experiments at seven locations on six representative field soils and two greenhouse soils in Pennsylvania. Results are analyzed here in 45 pages. Bulletin 586, The Pennsylvania State University, College of Agriculture, Agricultural Experiment Station, State College, Penn.

PREPARATION OF LIQUID FERTILIZERS. An eight page pamphlet containing two pages of mixing tables and a flow diagram for a liquid storage plant. Issued by Victor Chemical Works, Chicago.

BULLETINS OF THE AMERICAN POTASH INSTITUTE. Following are a few titles from the list of bulletins available from the American Potash Institute, Washington 6, D. C.: "Potash Losses on the Dairy Farm," serial no. T-4-46; "Boron for Forage Crops," serial no. D-2-52; "Ladino Clover—Its Mineral Requirements And Chemical Composition," serial no. E-2-52; and "Boron—Important to Crops, serial no. JJ-11-53.

TESTS OF AERIAL APPLICATIONS OF HERBICIDES ON POST OAK AND BLACK JACK BRUSH IN OKLAHOMA. Progress Report, 1954, by Harry M. Elwell and W. C. Elder. Reports experiments in which the selective, low-volatile esters of 2,4,5-trichlorophenoxyacetic alone and an equal mixture with 2,4-dichlorophenoxyacetic and 2,4,5-T, or 2,4,5-trichlorophenoxypropionic acid were applied with airplanes to study their effects on control of oak and on grass development in Oklahoma. Circular M-268, Agricultural Experiment Station, Div. of Agriculture, Oklahoma A. & M. College, Stillwater; and Field Crops Branch (Weed Investigations) Agricultural Research Service, U. S. Department of Agriculture.

CONTROL PROGRAM FOR INSECTS AND OTHER PESTS OF TRUCK CROPS, FOR COMMERCIAL GROWERS. Pest control recommendations based upon research and observations of entomologists of the Washington State Agricultural Experiment Stations and cooperating agencies. Since most of these pests are well known, no information is given regarding their life histories. Contains a list of pesticide tolerances of the Food and Drug Administration, Dept. of Health, Education, and Welfare. Ext. Mimeo. 635, Rev. April, 1955, Cooperative Extension Work in Agriculture and Home Economics, Extension Service, County Agent Work, Pullman, Washington.

MONTANA INSECT PESTS, 1953-4, THIRTY-FIFTH REPORT OF THE STATE ENTOMOLOGIST. Contains information regarding the status of the more important insects and control programs, including a special report on the goatweed beetle program. Bulletin 504, Montana State College, Agricultural Experiment Station, Bozeman, Montana.

EQUIPMENT AND METHODS FOR TREE SPRAYING, by S. F. Potts. Describes mist blower equipment, training of operators, new equipment, helicopter application and spray mixtures and concentrations. New equipment discussed includes dual-nozzle system for tall trees, a lightweight mist blower and knapsack mist blower. Reprinted from the Connecticut Arborist; available from Northeastern Forest Experiment Station, Upper Darby, Penn.

SERVING GEORGIA THROUGH RESEARCH, 1954 Annual Report, University of Georgia College of Agriculture Experiment Stations. Describes all 1953-4 projects. Also lists bulletins published during the period and personnel. Georgia Agricultural Experiment Station, University of Georgia College of Agriculture, Athens, Georgia.

LOANS TO FINANCE FERTILIZER NEEDS. A brief review of the principles involved in appraising credit to finance fertilizer applications. Reprinted from the April, 1955 monthly review of the Federal Reserve Bank of Minneapolis; distributed by The National Fertilizer Association, Washington, D. C.

ANHYDROUS AMMONIA, AMMONIUM NITRATE AND SOLUTIONS OF NITROGENOUS FERTILIZERS, by W. B. Andrews, State College, Miss. Contains a summary of the comparative information on anhydrous ammonia and ammonium nitrate. Data on ammonium nitrate in solution, as well as a critical analysis of the information on other nitrogenous fertilizers in solution are also presented. A reprint of Chapter 2 of the revised edition of "The Response of Crops and Soils to Fertilizers and Manures, 1954". Available from W. B. Andrews, State College, Miss.

Soil Treatments For Weevils

Aldrin and dieldrin at 7.5 pounds per acre controlled the large black vine weevil through the fourth harvest in strawberry and raspberry plots in experiments completed by the U.S.D.A., State College of Washington. Recommended practice is to spread 7.5 pounds of aldrin, dieldrin, or heptachlor evenly over the soil and work in with a disc harrow or rotary tiller to a depth of three to four inches. If a sprayer is more convenient, use three and three quarters gallons mixed with whatever amount of water the machine is set to distribute per acre.

In one test with blueberries, an ounce of 2.5 per cent aldrin or dieldrin, or 5 per cent chlordane gives good control for more than a year, when worked into a two foot circle three or four inches deep around each plant. Paul M. Eide, "Soil Treatments for Weevil Control in Strawberries and Raspberries," U.S.D.A., Northwestern Washington Experiment Station, Mount Vernon, Wash.

•

"Pybuthrin" Grain Protectant

Protection of grain for periods up to a year has been obtained with the use of "Pybuthrin" grain protectant; after 16½ months, treated grain is in better condition than untreated.

"Pybuthrin" is the trade name for a mixture of pyrethrins—the active principle of pyrethrum—and piperonyl butoxide. Addition of the synergist, piperonyl butoxide, increases the lethal effect up to eight or more times, depending on the species of insect, formulation and method of application. The Pybuthrin insecticides compared with the pyrethrum formulations are less staining, non-tainting and retain their insecticidal activity for longer periods.

Rate of application of Pybuthrin Insecticide No. 44 is about one gallon per 2,000 sq. feet as a direct spray and about one gallon per 1,000 square feet as residual film for prolonged action. As a powder, the products should be applied at the rate of four to six ounces per square yard. Protection is due to the repellent as well

(*Continued on Page 63*)

as the insecticidal property of the powder, and is effective against *Calandra granaria* (the grain weevil) and *Oryzaephilus surinamensis* (the saw-toothed grain beetle). J. L. Warner, "Protection of Stored Grain with 'Pybuthrin' Insecticides," *World Crops*, Vol. 6, No. 6, p. 251-252.

●

Rose Dusts For Pest Control

Multipurpose dusts that protect roses from most insects, mites, and diseases have been developed by U. S. Department of Agriculture scientists.

Tests carried forward at the Department's Agricultural Research Center, Beltsville, Md., since 1950 have turned up six combinations of insecticides, miticides, and fungicides of almost equal effectiveness. Each prevents damage by such common rose insects as aphids and leafhoppers, by spider mites, and by blackspot and mildew disease organisms. All are experimental formulations and are not now available on the market. However, many dust formulations are being sold for home garden use, and any that contain combinations listed below at approximately the same concentrations should be effective.

All six of the superior mixes contained 5 per cent DDT and 1 per cent lindane as insecticides, plus one of the following fungicide-miticide combinations: (1) 3.4 per cent copper, 25 per cent sulfur, 1.5 per cent Aramite; (2) 3.4 per cent copper, 25 per cent sulfur, 4 per cent malathion; (3) 7.6 per cent ferbam, 25 per cent sulfur, 1.5 per cent Aramite; (4) 7.6 per cent ferbam, 1.0 per cent Karathane, 1.5 per cent Aramite; (5) 6 per cent zineb, 1.5 per cent Aramite; (6) 6 per cent zineb, 1 per cent Karathane, 1.5 per cent Aramite.

●

Heptachlor For Wireworms

Applied as a dust, wettable powder, granular, or emulsifiable spray, heptachlor is effective in controlling the potato wireworm. It has been used successfully in an insecticide-fertilizer mixture and recent tests indicate maximum effectiveness when the material is disked thoroughly into the top several inches of soil before planting.

New Control of Snow Mold

Snow mold, one of the worst turf diseases in the Pacific Northwest, can be controlled with new phenyl mercuric fungicides. Dr. Jack P. Meiners, plant pathologist at the Washington Experiment Station, reports that three years of tests have proved that good protection can be gained with PMAS, Phenyl Mercury Solubilized No. 10, Puraturf, and Tact-C-Lect.

The disease, Dr. Meiners says, is most common in eastern Washington, northern Idaho, and western Montana where snow covers turf for long periods. Bent grass turfs are particularly susceptible to the disease.

Another of the fungicides that appeared promising in Dr. Meiner's tests was Cadminate, a cadmium compound. Although not quite as good as the mercurial acetates in controlling snow mold, Cadminate's success against dollar spot turf disease recommends its use as a dual purpose spray: to be applied in the late fall to control a late infestation of dollar spot and an early infestation of snow mold.

Dr. Meiner's research has shown that snow mold is associated with two fungus organisms working either singly or together. One of the organisms, *Typhula itoana*, causes snow mold only when the turf is covered with snow. The other, *Fusarium nivale*, can cause the disease to develop both under snow and during cool, moist periods in fall and spring.

Research was cooperative with the National Cooperative Turf Fungicide Trials, the American Phytopathological Society, and the Pacific Northwest Turfgrass Association.

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Control Of Armyworm

With the annual armyworm invasion on again, the New Jersey Agricultural Experiment Station, New Brunswick, N. J., has again made the recommendations of a five per cent toxaphene dust application, or 5 to 10 per cent DDT dust, for control of this pest. They caution, however, that these dusts should not be used on grasses for forage, silage or hay, nor on grains, because of possible harmful effects on livestock.

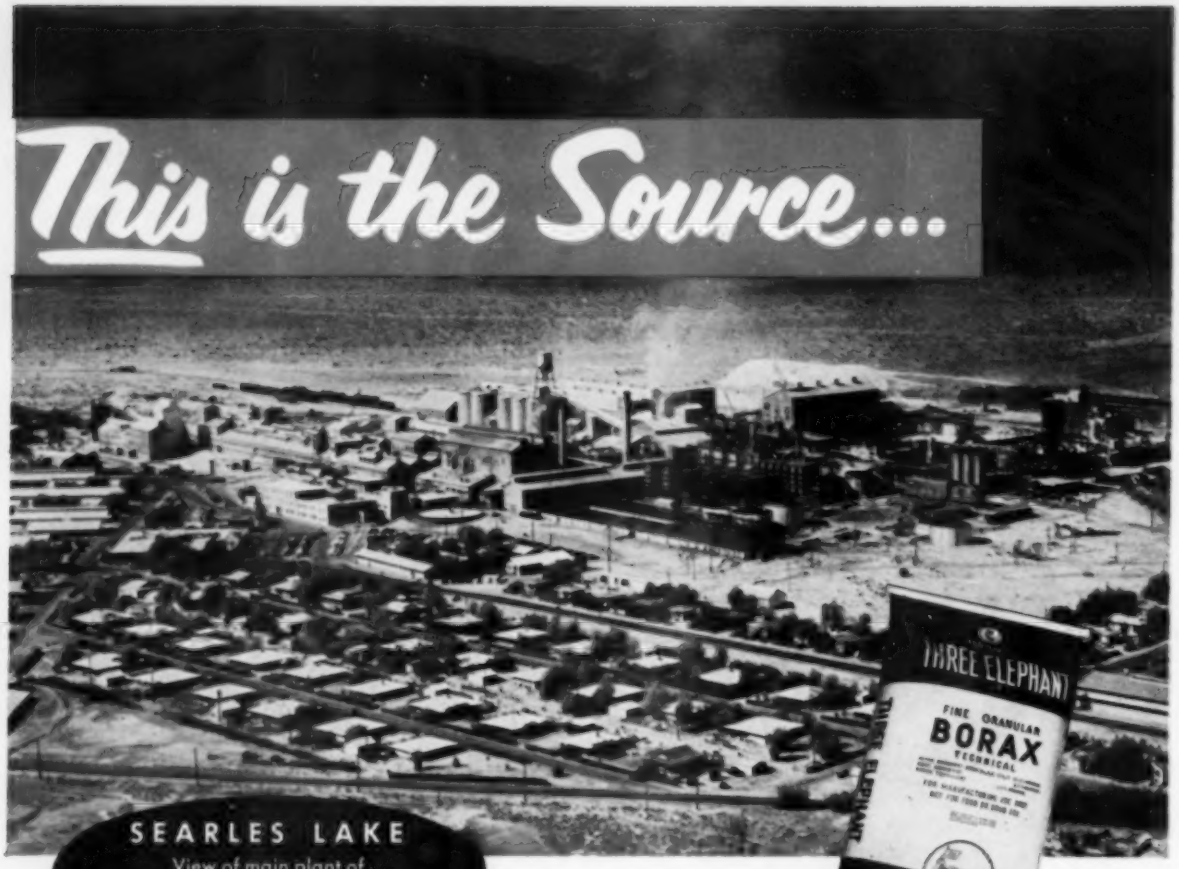
Maggot Damage Slowed

Good protection from cabbage maggots on spring cabbage through early application of insecticides including toxaphene (5 per cent dust). chlordane E. spray (2 pounds actual per acre), lindane E. spray (0.5 pounds actual per acre, and toxaphene E. spray (2 pounds actual per acre) was obtained in tests made in the 1950 season.

In 1951, experiments were continued, and the best protection in this study was obtained from three applications of five per cent heptachlor dust, resulting in 84 per cent of marketable heads. Good control was achieved also with a series of chlordane treatments. Other insecticides included in the experiments were lindane, aldrin, and dieldrin. The drench method of application was tested, with a wettable powder of EPN 300 giving the best protection.

The third method of application, dipping plant roots in an emulsion, proved to be the easiest and most successful of the three. In this method, the insecticide in emulsion form is prepared by stirring the required amount of the concentrate in a half gallon of water. The man pulling the plants takes the can with him to the plant bed, pulls 15-20 plants and quickly swishes the roots through the emulsion; plants are then placed in the regular baskets and kept in the shade until ready to set. A 45 per cent chlordane emulsifiable concentrate at a dilution of one to fifty has become somewhat of a standard commercially, with this method.

The following precautions should be observed in using the dip method: (a) keep the emulsion stirred so that no free oil accumulates on the surface; (b) pull the treat only as fast as the setters need plants, and water thoroughly as soon after setting as possible. Lindane and methoxychlor emulsions caused growth retardation and their use is not recommended. George E. Gould, "Cabbage Maggot Control," Purdue University, Station Bulletin 616.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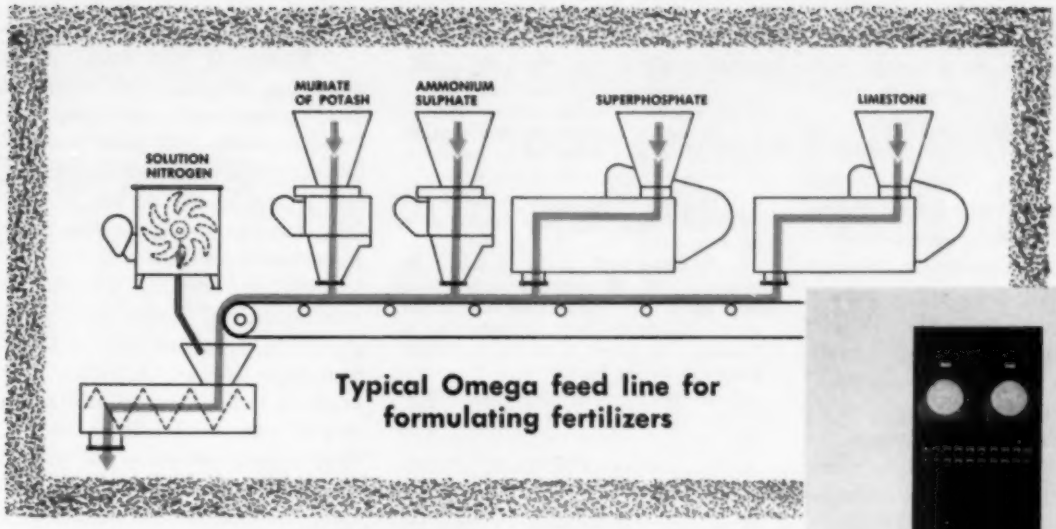

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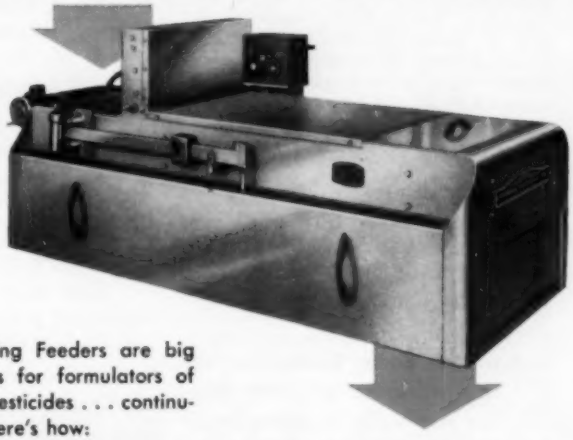

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Our Application Bulletin 10-H22A — "Continuous Automatic Proportioning in Fertilizer Production" — gives detailed information on Omega feed lines for the fertilizer industry. Write Don Warren for your copy today. Omega Machine Company, 536 Harris Avenue, Providence 1, Rhode Island.

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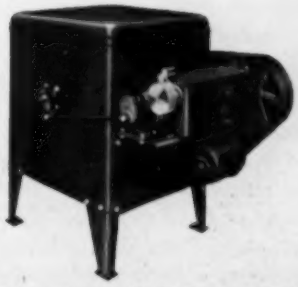

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B-I-F METERS FEEDERS CONTROLS

White Paint Relieves Pressure on Anhydrous Ammonia Tanks

The relief-valve popping problem on anhydrous ammonia tanks, aggravated in the hot weather, can be eased considerably by painting all containers white. This is the conclusion of tests completed by Phillips Petroleum Co. Recommendations for reducing the maximum pressure reached during hot weather include: (a) completely purge the container on its initial fill to remove the air; (b) do not overfill the containers—observe filling densities listed in the AAI Standards for the Storage and Handling of Anhydrous Ammonia; (c) paint all containers white, including all storage, pony, nurse, and applicator tanks, with a good "chalking" white paint; all transport tanks should be painted with a good glossy white; (d) do not paint any anhydrous ammonia containers with aluminum paints.

Seven factors which affect the pressure in liquefied anhydrous ammonia containers are listed as:

1) pressure-temperature relationships of the liquid equilibrium with its vapor.

2) cyclic ambient air temperatures which cause the contents of the containers to continually gain and/or lose heat.

3) thermal expansion of the liquid ammonia on heating causes the vapor to be compressed.

4) liquid level of the container determines both the wetted area, which in turn affects the heat transfer into or out of the container, and the reduction in volume of the vapor space due to thermal expansion of the liquid.

5) ratio of container surface area to volume determines, in part, the total heat flux per unit volume to the container.

6) air left in the tank will increase the pressure in the container due to the fact that pressure exerted by the mixture of air and anhydrous ammonia vapor will be higher than that exerted by the ammonia vapor alone.

7) surface condition of the container determines the absorptivity to solar radiation, which affects the temperature to which the liquid will rise, as well as the super heat existing in the vapor space. Paul W. Tucker and A. F. Dyer, "Paint Ammonia Tanks White to Keep Pressures Down," Agricultural Ammonia Institute, Technical Bulletin AA-6.

Race 15 B for Cereal Rust

Among 100 different fungicides and antibiotics tested during 1954 for control of cereal rust, especially black stem rust, Race 15 B, calcium sulfamate gave fairly satisfactory control both in experimental plots and in field tests. On durum, the yield was often doubled and the test weight increased as much as 10 pounds per bushel. This chemical injured the germination of the seed produced by treated plants and lowered the milling quality. Calcium sulfamate applied early in the season, or late when the grain is almost mature, seems to cause little damage to germination. Calcium sulfamate mixed with sodium sulfanilate and used at a somewhat reduced dosage per acre controls rust without serious damage to germination.

Karathrane, effective fungicide for control of mildews and for rust control in greenhouse tests, was not effective against intense rust epidemics in the field. Tests with calcium sulfamate applied by airplane were more encouraging. Unsprayed fields yielded only 2.3 bushels of low quality durum per acre, while sprayed portions yielded 12.2 bushels per acre of fair quality. Cereal Rust Control with Fungicides, W. E. Brentzel, *Bimonthly Bulletin*, North Dakota Agricultural Experiment Station, Vol. XVII, No. 4, March-April, 1955.

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Sugarcane Borer Control

Two species of imported parasitic flies may aid in sugarcane borer control. After 2 years of tests, research entomologists at the U.S.D.A. Sugarcane Field Station, Houma, La., have tabbed the parasites as "promising" for gaining partial control of this destructive sugarcane insect, and some Louisiana cane growers have imported and released the flies in their fields.

One of the flies—Metagonistylum minense—comes originally from the Amazon; the other—Lixophaga diatraeae—from Cuba. Both attack the borer in the same way. They instinctively deposit their eggs near the entrances of holes made by the borers as they chewed their way into the sugarcane stalks. The eggs hatch almost immediately into maggots that move into the holes and destroy the borers.

CIPC, Pre-Emergence Herbicide

Results of two years experimentation show that CIPC isopropyl N-(3-chlorophenyl) carbamate, compared favorably with other available pre-emergence herbicides used in cotton against annual grasses, particularly crabgrass, and against some other broad-leaved weeds.

Highest herbicidal effectiveness was experienced under cool, moist conditions. Optimum rates of CIPC were six to nine pounds per acre. The chemical had a long, residual action (six to eight weeks) for control of weeds during the season, yet allowed a wide margin of safety . . . so that cotton yields were never reduced even when CIPC was applied at rates as high as 12 pounds per acre. Chester L. Foy, "Effectiveness of Isopropyl N-(3-chlorophenyl) carbamate as a Selective Pre-Emergence Herbicide in Cotton," *Weeds*, Vol. III, No. 3.

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Band Addition Of Conditioners

Vegetable growers may use soil conditioners economically by applying a small amount of the chemical in a narrow band placed over the seed row at planting time. Crusting is reduced and seedling emergence increased.

Four and eight ounces of active ingredient per 1,000 feet of row applied in a band proved as satisfactory on carrots, beans and beets as the one-pound rate . . . or as a broadcast treatment of 350 pounds per acre of active ingredient.

A solution of four ounces of active ingredient per gallon of water applied at the rate of one to two gallons per 1,000 feet of seed row is recommended as insurance against soil crusting prior to seedling emergence.

Chemical soil conditioners used in the experiments at the New York State Experiment Station, Geneva, N.Y., were two different sodium salts of hydrolyzed polyacrylonitrile (HPAN) and a copolymer of isobutylene and the half ammonium salt-half amide of maleic acid (IBMA). Nathan Peck and M. T. Vittum, "Economic Application of Chemical Soil Conditioners," *Farm Research*, Vol. XXI, No. 2, April, 1955.

Pacific Coast Entomologists Discuss Khapra Beetle Control Yellow Clover Aphid - at Riverside

By Charles Starker

USDA Operations under the Miller Pesticide Amendment, Current Research on Aircraft Spraying, The Khapra Beetle, and the Yellow Clover Aphid, were some of the "headline" topics discussed at the 39th annual meeting of the Pacific Branch, Entomological Society of America, held at Riverside, Calif., June 22, 23 and 24. More than 400 entomologists were in attendance at the various sessions — with interests running from the taxonomic, to the control of insects by chemical or other means. The meeting attracted entomologists not only from the western part of the United States, but also Canada, Mexico, Australia, Spain and Costa Rica.

Officers elected for 1956 are Dr. Walter Carter, Pineapple Research Institute, Honolulu, Hawaii — Chairman — and Dr. Louis G. Gentner, Southern Oregon Experiment Station, Medford, Oregon — Vice-Chairman. Dr. Leslie M. Smith, University of California, Davis will continue as Secretary-Treasurer. The 1956 meeting will be held some time in June at the Claremont Hotel, Berkeley, Cal. By vote of the executive committee and later ratification by the membership, the executive committee was enlarged from 7 to 10 members in order to better represent the wide variation in interests among the branch membership. New members named to the executive committee include: Dr. L. C. Glover, Shell Chemical Corp., San Francisco, Dr. Martin M. Barnes, University of California, Citrus Experiment Station, Riverside, Calif., Dr. Charles Douchette, U. S. D. A. Sumner, Washington, and Dr. Hartford Keifer, Bureau of Entomology, California Department of Agriculture, Sacramento. Officers for the current session were John B. Steinweden, State Dept. of Agriculture, Los Angeles, Chairman; Walter Carter, Pineapple Research Institute, Honolulu, Hawaii, Vice-Chairman and Leslie M. Smith, University of California, Davis, Secretary-Treasurer.

"The Miller Pesticide Residue Amendment . . . is to set up a quick method for establishing tolerances or exemptions for residues of agricultural chemicals requiring registration under the Federal Insecticide, Fungicide, and Rodenticide Act, when such residues result from use of these chemicals on raw agricultural commodities," J. T. Coyne, Assistant Head, Pesticide Regulation Section, Plant Pest Control Branch, ARS, USDA, Washington, D. C., told the group. He then went on to state that "The Miller Amendment has interesting functional objectives, clearly setting forth the respective responsibilities of the Department of Agriculture and the Food and Drug Administration, so that determinations related to agricultural practice are distinctly assigned to the Department of Agriculture, and questions related to Public Health hazard are the exclusive jurisdiction of the Food and Drug Administration. Such delineation resulting in the highest degree of expert judgment possible in the administration of the statute.

"The Department of Agriculture has two major responsibilities in administration of the Miller Amendment, the primary one being to certify to the Food and Drug Administration as to the usefulness of a pesticide chemical for the purpose for which a tolerance or exemption is sought. The second responsibility is to submit an opinion to the Food and Drug Administration as to whether the tolerance or exemption proposed by the petitioner reasonably reflects the amount of residue likely to result when the pesticide chemical is used as directed.

"The procedue works like this—any person who has registered or who has submitted an application for the registration of an economic poison under the Federal Insecticide, Fungicide, and Rodenticide Act may file a petition proposing the issuance of a regulation establishing a tolerance for a pesticide chemical which constitutes or is an ingredient of the economic poison, or the petition may propose the exemption of the pesticide chem-

Top left: W. Carter, State College of New Mexico; Dr. Rosmarie Von Rumker, Chemagro Corp.; and L. Gentner, Oregon State College.

Bottom left: L. Smith, Univ. of California; J. B. Steinweden, California Department of Agriculture, retiring chairman of Pacific ESA; G. Decker, Illinois Natural History Survey, president of National ESA.

Center: Registration at the pacific ESA meeting: (seated) R. Daehnert, General Chemical Co., Los Angeles; and H. E. Pierce, Hercules Powder Co. (back row) O. Steinen, Naugatuck Chemical Co.; B. Bartlett, CES; J. Ortega, Citrus Experiment Station; and registering at desk, R. Fye, New Mexico A & M.

Right: O. B. Hitchcock, Chemagro Corp. and G. F. MacLeod, Sunland Industries.

Top photo: I. C. Manis, Univ. of Idaho; E. Bussart, Velsicol Corp.; and E. G. Linsley, Univ. of California.

Second from top: J. Newton Hall, Olin Mathieson Chem. Corp.; W. E. Horn, American Potash and Chemical Co.; Charles Bowen, A.L. Castle Co.

Third from Top: P. Dresher, American Chemical Paint Co.; R. Baron, American Cyanamid Co.; and J. H. Turne, Atlas Powder Co.

Second from bottom: G. Black, California Spray Chemical Co.; D. Denning, Velsicol Corp.; and P. Allen, Geigy Chemical Co.

Bottom photo: S. C. Braucher, Dow Chemical Co.; C. O. Barnard, Executive Secretary, WACA; Ivor R. Burden, United Chemical Co., San Francisco.

ical from the requirement of a tolerance. The petition consists of seven parts and the following informational data regarding the chemical should be given:

a. Name, chemical identity, composition.

b. amount, frequency, and time of application proposed.

c. full reports of investigations made with respect to the safety of the pesticide chemical.

d. results of tests on amount of residue remaining, including a description of analytical methods used.

e. practicable methods for removing residues which exceed any proposed tolerance;

f. proposed tolerances for the pesticide chemical, if tolerances are proposed; and

g. reasonable grounds in support of the petition.

"In order that the law will not work an undue hardship on those petitioning, there are a series of time limits governing the functions of the respective governmental groups. Thus the Department of Agriculture must normally effect its certification of usefulness and opinion on residue within 30 days. However, the law provides the Department a 30 day extension if the Department notifies the petitioner before expiration of the original 30 days that such extension is necessary.

"One point which might be confusing is that certification under the Miller Pesticide Amendment, and registration under the Federal Insecticide, Fungicide and Rodenticide Act are not the same thing. The Certification of usefulness simply means the chemical has utility in Agriculture. The criteria for usefulness are not the same as those required to prove effectiveness under the Insecticide Act. Therefore, . . . in the usual case, registration will not be granted until the tolerance or exemption has been established, and there is evidence the resulting residues will not exceed the tolerance.

"A majority of the uses proposed in petitions to date have been for those for which some formulation of the particular chemical involved has previously been registered under the Federal Insecticide, Fungicide, and Rodenticide Act. In those cases, the effectiveness of the chemical had previously been determined at the time of registration. In some cases, uses of the chemical have been extended beyond those previously registered, but on the basis of use experience, data submitted, and other information collected. On such evidence, with a few exceptions, new uses have been certified. The greatest certification problems have come from proposals involving entirely new chemicals. These require an extensive search of literature and frequent communications with State and Federal ARS Scientists to gather sufficient data to either affirm or disaffirm the data included in the petition.

"Difficulties have been encountered in

forming opinions on tolerances or exemptions proposed by the petitioner and which must be submitted by the Department to the Food and Drug Administration. Thus in many cases the residue data submitted with respect to a particular use has been insufficient to serve as a basis for a fair opinion. In some cases there have been no data whatsoever, with respect to a particular crop. Where the petition shows residue results on another crop in the same family, we have been able in many cases to transfer the application of such data to the crop on which no residue work has been done and thus obtain a basis for our opinion. At other times, this problem of transferability has involved crops of such widely diverse characteristics and growing conditions that transferability of residue data was impractical. Another tough problem is the necessity for extensive projection and supplementation of data. Frequently in petitions reviewed to date, directions for use and residue work have not been consistent with respect to amounts of chemical to be used and interval between last application and harvest. Thus the directions may recommend use of a pound of a given chemical per acre with a 14-day interval between last application and harvest. The residue data, on the other hand, is based on the use of 6-8 oz. of chemical at intervals ranging from 21-40 days. Such data requires extensive projection of results to even approximate what the resulting residue might be.

"All of us affected by this statute have problems in accomplishing compliance with this new law . . . The State and Federal ARS scientists have done much in developing agricultural chemicals. They can make a further contribution to the easier operation of this law. If, when possible, they could in future research operations gear their effectiveness and residue work, to the greatest possible extent, so that there are residue results aligned to each dosage and application schedule recommended, they can greatly contribute to the success of the Miller Amendment.

"Should the certification of usefulness to the Food and Drug Administration state the chemical is not useful, or useful for only some of the purposes proposed in the petition, the petitioner has one week after receiving notice of the proposed certification to request a hearing on it, or the parts to which he objects. This appeal relates only to the certification of usefulness. There is no appeal from the second function of the Department, the opinion on residue. Within ninety days after certification of usefulness by the USDA, the Food and Drug Administration must propose an exemption or tolerance for use of the pesticide chemical as set forth in the petition. Such limitation can also be extended, if the person filing the petition requests the petition be referred to an Advisory Committee, as authorized under the law. If this occurs, the Commissioner of Food and Drug Administration then requests the National Academy of Sciences to select at least three experts, qualified by training and experience to evaluate safety of pesticide chemicals, to serve on the Advisory Committee. At least one of these experts shall be a representative of a land-grant college. The committtee has 60 days from receipt of the petition and supporting data to make a report on proposals contained in the petition. An additional 30 day time limit may be requested by the committee if needed. Within 30 days after receipt of an Advisory Committee report, the Food and Drug Administration must publish an order establishing an exemption or tolerances for the uses of the pesticide specified in the petition. The law also provides for an administrative hearing for any person who objects to a regulation proposing a tolerance or exemption as published by the Food and Drug Administration."

Mr. Coyne concluded by stating "We believe this law will establish greater public confidence in the use of agricultural chemicals. Expanded use of agricultural chemicals should result in a more abundant and economical food supply; the fundamental responsibility of all of us engaged in agriculture. Working together toward the successful administration of this law, we can take a big step toward the attainment of these objectives."

Research on Aircraft Spraying

THIS panel was moderated by Kenneth Messenger of the Aircraft and Special Equipment Center, ARS, USDA, Beltsville, Md., who opened the discussion with the statement that currently there are some three million acres of forest and range lands to be treated by airplane. Jobs the size of these emphasize the need for continual research.

Charles Branstetter, chairman, Agricultural Aircraft Operators Council, Sacramento, Calif., stated that "Pest control has grown up since world war II. With application of pesticides often of an emergency nature, both operators and pilots must be on speaking terms with chemical requirements for pest control. Some 175 crops in California are treated with pesticides applied by plane, and California has 1,200 of the 2,000 planes registered for agricultural use on the west coast.

Among the several advantages of planes, Branstetter mentioned that 1) planes are faster on the job, are flexible and adapted to emergency treatment if needed, 2) are cheaper than the use of ground equipment, 3) have the advantage of not mechanically contacting growing crops, 4) when properly used, do the job better than other types of application equipment.

Research on Agricultural Aircraft and Spray Distribution was discussed by

Top left: Otto P. Steinen, Naugatuck Chemical Div.; L. C. Glover, Shell Chemical Co.

Top right: Ken Gillies, Diamond Black Leaf Company; Harvey Bales, Arizona Pest Control Co.

Bottom left: Robert Geary, Farvenfabriken Bayer; Bud Mack, Plant Products Corp.

Bottom right: J. M. Rivero, Institute Investigaciones Agroniminas, Spain; Ashley Brown, Rohm & Haas Company.

George A. Roth, Personal Aircraft Research Center, Texas A & M College, College Sta., Texas. He mentioned that their research is channeled toward greater pilot safety. Illustrations of the AG I and AG II were shown, as was one of the AG III, which is a prototype of the AG II, featuring pilot safety and wide field of vision. This is a steel tube and fabric plane, with rated payload of 800 lbs., and powered with a 135 hp engine. Other models he discussed briefly included the Piper P-18 A, the Fletcher Wiley and the Air Tractor. On spray distribution, their work was centered around individual nozzle tests to determine the effect of wind displacement on spray patterns. In a summary of their work, he mentioned that lowest air speeds have given the highest practical swath width when using a fairly large orifice.

Control of Forest Insects by Aircraft was next discussed by David Isler, of the Agricultural Engineering Research Branch, USDA, Beltsville, Md. He stated that their work has been directed toward increasing the efficiency of the airplane and reducing operating costs. Spray particle size research was done on a ship fitted with two sets of spray booms so that in a single test two different micron sized droplets could be run under comparable conditions. Spray solutions used were distinctly colored, and droplets collected after discharge on specially treated target papers. Spray deposit results were then determined by chromatographic means. As a result of their research, it is believed that droplets of 150 microns median mean diameter are most effective when released at 50-foot elevations in upwind flight. Field control work on spruce budworm has borne this out. In large forested areas, air application of pesticides is the only practical method of control. Costs have been brought down from three dollars to one dollar per acre, with added savings possible by increase in effective swath width, the development of more effective formulations and increased pilot safety.

Spray Equipment For Citrus

DR. Glenn E. Carman, Citrus Experiment Station, Riverside, Calif. told the group the citrus tree is a unique challenge, as spray application is much more difficult than on deciduous trees. Coverage and penetration into the tree is quite difficult. Until recently, considerable manpowder and high gallonages per acre were required, (as much as 2,000 to 4,000 gallons). Uniform application by equipment is essential; where a hand gun is used, operator fatigue may cause irregular skips, but when mechanical failure occurs, it is usually consistent. Another factor in favor of newer types of equipment is that fewer people are exposed to certain of the more hazardous materials now in use.

Two basic types of sprayers are now in use, one being the oscillating boom type, featuring large volume and high pressure discharge. From the standpoint of utility and full coverage spray, this type is most satisfactory. The second type rig, the blower, may be one of several variations. It may be of the "master fan" type, with wind velocity of around 60 mph and large pump capacity, or of the "speed sprayer" variety with an axial flow fan and 120 mph wind velocity, low pump pressure and high pump capacity. The speed sprayer or blower may possibly be adapted for citrus use, but at present they are not up to full coverage. Current work at the Citrus Experiment Station is directed toward assisting in perfection of this equipment.

Organic Phosphates and Mite Resistance

"DURING the past five years many organic phosphate materials have been tested on station blocks of D'Anjou pears." Dr. Louis G. Gentner, Southern Oregon Experiment Station, Medford, Oregon told the group. "This work led us to believe we had a phosphate material which would control mites and also be effective against the pear psylla. When organic phosphorous materials were tested last spring, 11 days after the first mite count, all the non-phosphate materials had completely wiped out mite populations, while all of the phosphates, including three systemics, failed to depress the population below a point which would cause commercial injury. The three plots where systemics were used had serious injury to foliage from mite feeding and it was necessary to apply Aramite to stop serious tree defoliation. Another application of these same systemics was made to another block of pears, with Aramite used as a reference material. This test produced the same results as the earlier one. EPN was applied to three commercial orchards in the Valley and in two it failed to give control. In the third, control was excellent."

They have been forced to conclude that the two-spotted mite is definitely resistant to organic phosphate sprays. Not one organic phosphate material used gave commercial control, while all of the non-phosphate materials used gave control.

Cyclamen Mite on Strawberries

"ENDRIN is the most effective chemical of those tested as sprays against cyclamen mite on strawberries" Dr. William W. Allen, Univ. of California, Berkeley told the group. Endrin at 3.2 lbs. actual in 800 gallons of spray per acre has given control of the mite on strawberries for varying periods of time. In central California because of the warmer weather, control will not last beyond the end of the first crop. In cooler areas it may last until the end of picking season.

Some growers have their own idea of control and use a 2% parathion dust @ 800 lbs. per acre, applied to plant crowns. While endrin is promising from the control phase, two applications would probably be needed in many areas, and this would tend to bring the tolerance up to a point where it would conflict with federal regulations.

The use of heated methyl bromide under plastic tarps has limited application for cyclamen mite control. Two pounds of the fumigant are applied for a 2-hour exposure period at temperatures of 65-80°F. The temperature can be raised to 85° if plants are dormant. If a higher temperature is used, plants may be killed. In making checks of treated fields it was noted that the marginal rows still had some mites, indicating inadequate gas penetration to those areas.

Khapra Beetle

"THE Khapra beetle is the last of the five major world grain pests to become established in the United States" stated H. M. Armitage, Chief, California Dept. of Agriculture in opening the panel on this pest. "While funds in excess of one-half million dollars have been expended to date, with an additional $100,000 contributed by the USDA, this amount, large as it is, is less than one-fourth of one percent of the annual farm value of the major crops being protected," Mr. Armitage continued. "If accepted as an established pest, a one percent loss would equal over two million dollars annually from here on out."

"The Khapra beetle has graphically shown the economic importance of taxonomy in identifying economic pests. In any new pest situation the first step necessary before control measures may be effectively set up is to have an accurate identification of the pest. After this is done, the accumulated knowledge concerning the pest is unlocked." stated Dr. H. H. Kiefer, Bureau of Entomology, California Department of Agriculture, Sacramento. "The identification problem is very complicated in the case of Khapra beetle, as it is one of 7 members of the same genus, all of which look very similar and occur in California under similar conditions. Until the recent development of a field key, identification was a matter for the trained taxonomist. As an illustration of the importance of this identification, one $10,000 control program depended upon the identification of a single cast skin."

Dr. L. A. Carruth of the University of Arizona, Tucson told the group that Khapra beetles prefer hot and dry climates, with a temperature of 90°F optimum for development in grain of low moisture. It is felt that this pest offers the worst threat to the southern part of this country, although it can also survive freezing temperatures and is very resistant to unfavorable conditions when in the larval stage. There is one report on record of a larva staying in that stage for a 7-year period because of lack of food. Food preference is quite wide, young larvae preferring fragments of grain, while older ones are able to penetrate walls of whole grain. The larvae apparently prefer processed material. They have been reared through on black eyed peas, sorghum, corn, and barley. Alfalfa seed, flax, cotton seed, sugar beet and castor beans seeds are less frequently attacked.

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Decker Addresses W.A.C.A. At Los Angeles Meeting

By Charles Starker

Left: S. W. Strew, Chipman Chemical Co., president WACA; George Decker, Illinois Natural History, president Entomological Society of America; O. C. Barnard, executive secretary, WACA; and J. Neace, Marsh Aviation Co.

Insert: Arrangements Committee: C. H. York, Shell Chemical Co., E. Davis, Los Angeles Chem. Co. and R. Hillebert (not in photo).

DISCUSSIONS on cooperation between government and research groups, practical aspects of package deal sales to aerial applicators, and the California industrial safety directive highlighted the Western Agricultural Chemicals Association annual spring meeting, June 21, Hotel Clark, Los Angeles.

Some 100 members and guests attending the convention were told by George C. Decker, "that the two basic questions before us today are: how can we reduce the costs of our research programs, and (2) considering their many diversified interests and responsibilities, how can governmental agencies, with the limited funds at their disposal, most effectively cooperate with industry in the development of new pesticides?" In discussing "Integration of Industrial and Governmental Research on Pesticides," Dr. Decker, Illinois Natural History Survey, Urbana, Ill., president of the Entomological Society of America, pointed out to the group that:

"In the development of new pesticides, industry and government have many interests in common, but they also have their individual diversified interests and points of view. The agricultural chemicals industry," he said, "will logically and understandably, be interested primarily in the discovery, development and sale of pesticides. Of course, he observed, industry has an underlying fundamental interest in basic research, but the amount of research it will undertake or finance will be limited, except in instances where such research may have a direct and tangible relationship to sales."

Dr. Decker pointed out the need for closer liaison and exchange of preliminary data between researchers. Too often, he said, after working diligently and sometimes fruitlessly for a year or more, researchers find that coworkers in another laboratory covered the same ground with the same results a year or two before. "Negative results and details of studies pursued in the development of techniques and methods are too often omitted in publications," he announced.

Personal safety and public health are dominant forces behind most legislative action, WACA members were reminded by Dr. Decker, who pointed out that not too long ago "public anxiety created by a long series of unfavorable news releases brought forth a congressional investigation and new legislation was proposed, some of which might have proved disastrous." When confronted with this possibility, industry and agriculture combined forces to support the Miller Bill which was eventually passed. "Now," Dr. Decker reported, "there are those who complain that it is unrealistic and imposes undue hardships."

"Some feel that the provisions of Public Law 518 (Miller Bill) are such as to inhibit or seriously stifle the development of new pesticides. That is probably true, but the rules of the game are quite clear. Any individual or company interested in developing a new pesticide can determine in advance, with a considerable degree of accuracy, the legal requirements of the Act and the probable minimum cost of the research required to produce the necessary data.

"Dr. Decker reported," that "the National Research Council has formulated a statement of the principal requirements in the development of a new agricultural chemical which in general is quite in agreement with the law and which may be used as a guide. This report includes a diagrammatic outline of a balanced program that would, in theory, at least, develop the various lines of required research simultaneously in a series of parallel investigations. At times research personnel, both in and out of industry, become unduly enthused by promising leads developed in some one phase of this overall research program and overdevelop it at the expense of other equally important and necessary projects which then lag far behind. Perhaps at times men in product development or sales departments become overwhelmed by the potential market they envision, and ignoring or forgetting the lengthy, expensive research on residues and toxicology that will be necessary, they present a glowing picture to management to obtain a sizable appropriation for additional biological studies. Then, when a petition for registration or a tolerance is denied on the basis of inadequate residue or tolerance data, in self defense they cry the law and the rules are too rigid and unjustifiable."

Dr. Decker suggested to WACA members that the basic manufacturers become perfectly familiar with all registration and tolerance requirements. Then as each new potential use or market is developed they should, as far in advance as possible, list their various research data requirements and indicate where and how each requirement is to be met. If advised sufficiently in advance, he said, agricultural agencies, state laboratories, etc., will be able to obtain performance data more rapidly and often as a

by-product of research already in progress.

Dr. Decker concluded his remarks with the following statement:

1. All agencies interested in agriculture recognize the need for better pest control.
2. We have a large array of pesticides available, but there is still room for more efficient and more economical materials.
3. While there is little doubt the consumer will eventually profit most from the development of new pesticides, industry's profit motives are so evident it seems probable that for some time to come the average taxpayer will insist that industry must foot most of the bill.
4. Public and private research agencies will be primarily interested in the development of a new pesticide that will fill some obvious void, but so long as other important problems demand prior consideration they will have little interest in finding new materials that are no better than those we now have and possess no unique advantages.
5. Most laboratories have limited facilities which are largely committed to definite lines of well planned research. They can normally undertake only a limited number of additional studies and often only those that can be conveniently fitted into the existing work program.
6. To obtain maximum cooperation from other agencies, one must have a sound program worked out well in advance: (a) know exactly what information he must obtain; (b) locate as far in advance as possible cooperators who can conveniently and advantageously develop various segments of the project; (c) supply each cooperator with such leads and technical data as will assure a reasonable prospect of success.
7. The prerequisities to registration and the establishment of a tolerance for new pesticides are clearly set forth. The cost involved may range from one-half to one and one-half million dollars. The potential producer should recognize these facts before he embarks on a product development program, and at a very early date in the development of each product he should: (a) clearly establish the unique advantages and disadvantages of each material and decide whether or not it is worth developing; (b) determine its greatest potential uses or markets and exploit these before attempting to develop others; (c) list his data requirements and develop a research program that will provide the required data at a minimum cost and with a minimum of inconvenience to his cooperators.
8. Once a material has attained marketability, establish new uses and new markets as rapidly as possible.

Views On The Package Deal

THAT "agricultural aviation" is *not* hazardous was one point John F. Neace, Marsh Aviation Co., Phoenix, tried to impress on WACA members in delivering an address on "The Economic and Practical Fallacies of the Package Deal." He further emphasized that, in his opinion, the "'package deal," whereby chemical manufacturers sell direct to aerial applicators, is a plan which leaves too much opportunity for misuse and error. He reported that in the long-run, the man who loses in this deal is the grower . . . furthermore, that the grower loses every time he doesn't get two bills: (1) a bill from the chemical company for the chemicals sold, and (2) a bill from the applicator company for actual application.

Mr. Neace advised that one danger of the "'package deal" is that the chemical manufacturer and his product lose their identity . . . that the farmer associates pest control not with the chemical supply company or the chemical product, but with the man with whom he has actual contact . . . that is, the aerial applicator . . . another danger he said, is that too much opportunity to dilute the chemical, reduce the rate of application, and just not apply the material is left to the applicator working on a "package deal." For the protection of the farmer, and for the protection of the chemical company, Mr. Neace said that it is important that the agricultural chemical supplier sell to the farmer, and that mobility be retained.

Mr. Neace suggested that the mode of aerial operation follow that of the government air force plan of action:

That: (1) a field man find the target; (2) a county agent, or qualified technical man identify the pest and recommend a control measure; (3) a chemical company supply the ammunition for killing the pest; and (4) a responsible agricultural aircraft company deliver the chemical to the original target. Mr. Neace pointed out that each of these operations requires a specialist, and that no two can be combined to the best interest of the farmer.

S. W. STREW, Chipman Chemical Company, president of WACA, asked Frank Kirkpatrick of American Cyanamid to report on a recent directive of the California Industrial Safety Division, which includes several points of caution and instruction.

Some points in the orders were described as somewhat unrealistic so far as agricultural practices are concerned. The directive instructs that

"All empty original metal drums or metal containers that have contained organic phosphates or other hazardous pesticides shall be returned to the supplier."

"All employees exposed to parathion and other organic phosphates be placed under competent medical supervision: evidence of such supervision to be made available, upon demand, to the Division of Industrial Safety.

"Wherever the label on the pesticide container indicates additional treatment, the employer shall make available the antidote and shall also make proper provision for competent administration of the antidote in the event of an emergency."

"Where due to environmental conditions of temperature and humidity it is practically impossible to comply with the requirements for personal respiratory protection and complete body protection as the major means of safeguarding employees, the Division of Industrial Safety will require the employer to provide filtered, cooled and ventilated cabs for mobile equipment and/or closed systems for loading the pesticide into application equipment. Cabs and other required systems shall be of such design and construction as will enable the employee to perform his duties without harmful exposure to the poison."

The directive states further that "all pesticides are economic poisons and fall under the provisions of those sections of the General Industry Safety Orders which apply to poisons."

Executive Secretary C. O. Barnard advised the membership that WACA would work closely with other trade associations in clarifying all legislative matters pertaining to the industry. He indicated too that the western group is working very closely with the National Agricultural

(*Continued on Page* 119)

INDUSTRY *News*

Plant for NH_3 Conversion

Re-Mark Chemical Co., Inc., Miami, manufacturers of agricultural insecticides and fungicides, has announced construction of an aqueous ammonia conversion plant scheduled for completion in about eight weeks at Hallandale, Fla.

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Lidov Joins Brea Chemicals

Dr. Rex E. Lidov has been appointed research associate in the research department of Brea Chemicals, Inc., Los Angeles. He was formerly assistant manager of Shell Development Company's Agricultural Chemicals Division in Denver. Prior to his association with Shell, Dr. Lidov was assistant director of research for Velsicol Corp., Chicago, and later director of research for Julius Hyman and Co., Denver. He was prominently connected with development work on the insecticides, chlordane, dieldrin, endrin, aldrin and isodrin.

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American Ag. Buys Hamm Co.

American Agricultural Chemical Co., New York, has just purchased the Hamm Company from the estate of the late V. R. McCoy. The Hamm fertilizer plant at Washington Court House, Ohio, becomes the 29th fertilizer factory in the A. A. C. organization.

Acquisition of the Hamm plant will enable American Agricultural to broaden its service to farmers in south-central Ohio. A number of changes and improvements will be made in the newly acquired plant. When completed, it will start production of "Agrico" and "AA Quality" fertilizers for the coming Fall season.

H. R. Dinges

H. E. Bingham

Spencer Names Sales Managers

Spencer Chemical Co., Kansas City, Mo., recently announced two executive appointments and the reorganization of its sales division into seven departments. H. R. Dinges, formerly assistant general sales manager, was named general sales manager; and H. E. Bingham, who was acting director of product sales, was appointed general manager of sales services. Mr. Bingham's duties will cover four departments: sales development, agricultural chemicals; sales development, industrial chemicals; traffic and advertising.

After joining Spencer in 1947 as industrial sales manager, Mr. Dinges was advanced to director of product sales, and in December, 1954, took over as assistant general sales manager.

Mr. Bingham joined Spencer in July, 1946 as traffic manager, afterwards serving as director of traffic, until he was named acting director of product sales last December.

NE Phytopaths To Meet Nov. 3

The northeastern division of the American Phytopathological Society announced plans to hold its annual meeting Nov. 3-4 at the Eastern States Farmers Exchange, Inc., West Springfield, Mass. Program details will be announced later.

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Val Weyl Joins USDA

Val E. Weyl, formerly in charge of publicity and public relations for the National Agricultural Chemicals Association last month joined the Plant Pest Control Branch, Economic Insect Survey Section of the USDA in Washington, D. C. He will be working with J. W. Gentry. Among other duties, he will prepare the Cooperative Economic Insect Report.

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Pennsalt Move Phila. Office

The executive offices of the Pennsylvania Salt Mfg. Company, including those of its Chemical Specialties Division, have been moved from previous quarters in the Widener Building to the newest and most modern office building in Philadelphia, 3 Penn Center Plaza.

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To Hold "Clean Grain" Meeting

The U.S.D.A. has arranged a meeting for members of the grain trade and agencies concerned with the production and marketing of clean grain, to be held in Washington, July 8. Purpose of the meeting is to better acquaint producer, handler, and processor groups with the clean grain

educational programs now being carried out by state extension services and the U.S.D.A., and to study way of increasing effectiveness of these programs.

William J. Haude

Haude Named Grace Gen. Mgr.

William J. Haude, formerly vice-president in charge of marketing for Grace Chemical Co., has had the responsibilities of the general managership of the company added to his marketing role. Headquarters of the company were recently transferred from New York City to Memphis. John Carriere, plant manager, has been named a vice-president of the company. Plans to increase the plant's production of ammonia have been announced and addition of new process plants is under consideration.

Establishment of a new division of W. R. Grace & Co. has been announced. It will be known as Grace Chemical Research and Development Company Division and will be headed by William Gage, formerly president of Grace Chemical Co. The new division will spearhead anticipated further expansion in the chemical manufacturing and processing fields.

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Advise Night Spraying

The Agricultural Marketing Service, U.S.D.A., has published a bulletin recommending that pyrethrum sprays or aerosols be applied between 6 P. M. and midnight for suppression of stored-tobacco insects in warehouses.

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Install Seed Treating Facilities

The Olathe Potato Growers Cooperative Association, Olathe, Colorado, has recently added to its bean cleaning and treating facilities, constructing a $100,000 addition to replace buildings and equipment lost in a fire last December. Installation of new equipment includes a Panogen KS-3 Treater with slurry attachment.

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Chemical Enterprises Elects VPs.

Charles H. Lockton has just been elected vice-president and treasurer of Chemical Enterprises, Inc. He has recently been engaged in import-export in Turkey, serving for three years as president of E. R. Squibb and Sons of Turkey. Maurice E. Ash has been elected vice-president of Chemical Enterprises in charge of purchasing. He has headed the purchasing division of Merck and Co.

Ivor R. Burden

Burden Named Heckathorn V.P.

Ivor I. Burden has just been named vice-president and general manager of Heckathorn and Co., United Chemical Co., and United Fertilizer Co., Richmond, California. This came as one step in a reorganization program announced by E. S. Heckathorn, president of the three affiliated companies.

Other developments include the appointment of Harry R. Field as sales manager of Heckathorn and Co., with Peter Cherian as sales manager of United Fertilizer Co. and purchasing agent for all three companies. E. G. Trimpeh has been named operations manager and assistant secretary of all three companies. George G. Robinett is now chief accountant; Herbert Fawcett is credit manager; M. D. Riddle manager of the development department, and Melvin Bjorum is manager of stock control.

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Radco-CEI Merge

The Radco fertilizer companies of southwestern Iowa have been merged with Chemical Enterprises, Inc., N. Y. Present management of Radco will remain unchanged; Dan B. Curll, Jr., of Chemical Enterprises and Tully W. Talbot, president of Chemco have been elected to the Radco board of directors.

Correction

It has been brought to our attention that the report concerning the Agricultural Institute of Canada, page 93 of the June issue of *Agricultural Chemicals*, was inaccurate. Following is the correct version of the news item:

The Agricultural Institute of Canada elected Wallace A. Thomson president-elect and named four new directors to its National Council. Elected for the two-year period 1955-57 were: Harold F. Stairs, N. B. Dept. of Agriculture, Fredericton, who will represent the Maritime provinces; Howard A. Steppler, Macdonald College of McGill University, to represent the province of Quebec; Lloyd M. Ramsay, Soldier Settlement and Veterans' Land Act official, London, to represent the region of Western Ontario; and Dr. Sol. Sinclair, University of Manitoba, Winnipeg, to represent the province of Manitoba.

Mr. Thomson, the president-elect, was formerly president of the Saskatchewan Institute of Agrologists and was director for Saskatchewan on the national council of the Institute from 1950-52. He will spend an additional year on the national council before becoming president in 1956. Mr. Thomson was to take over as president-elect at the 1955 annual meeting of the Institute, which was scheduled to be held in Edmonton, June 20-23.

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LIFE gets riskier every day for mosquitoes and their companion health threats—gnats, ticks, chiggers, fleas, sand flies, and a host of other insect pests—as more and more formulators turn to dieldrin as their number one insecticide.

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Pennsalt Chemicals

New Escambia Plant In '56

Construction is under way for a petrochemical plant to be operated by Escambia Bay Chemical Corp., between Milton and Pensacola in Santa Rosa County, Florida. Cost of the plant, including other facilities to be built later, will exceed $25,000,000.

Using natural gas as the principal raw material, the Santa Rosa County plant will produce as much as 250 tons of anhydrous ammonia per day, from which a daily output of some 220 tons of nitric acid, 275 to 350 tons of ammonium nitrate, and 200 tons of ammonium nitrate-ammonia fertilizer solutions may be developed. Ashcraft-Wilkinson Co., Atlanta, have been designated sales agents for the fertilizer products of Escambia Bay Chemical Corp. Completition of construction work by Chemical Construction Corporation, New York, contractors, is scheduled for January, 1956. When in full operation, the plant will employ more than 200 people.

Officers of the new firm, all officials of the United Gas Corporation, are M. A. Abernathy, president; J. H. Miracle, vice president; L. V. Tracht, treasurer; E. J. Freiberg, secretary; and A. L. McClellan, assistant treasurer.

•

Calspray Names Wash. Mgr.

Richard H. Trumble was recently named to the position of branch manager in the Wenatches, Washington, offices of California Spray-Chemical Corp. He succeeds Harold J. Matson, who is being promoted to the position of district manager for the Pacific Northwest area.

•

Grace Plant Starts Urea Prod.

The first commercial shipment of urea from Grace Chemical Co.'s new nitrogen plant at Memphis, Tenn., was marked last month in a brief ceremony by officials of Grace and the Perkins Glue Co. The $20,000,000 petrochemicals plant, dedicated Jan. 6, (*Agricultural Chemicals, February, 1955, pp.* 32-33), manufactures anhydrous ammonia and urea. Production of ammonia commenced last December and presently exceeds the designed capacity of 250 tons per day. Urea production, according to William J. Haude, vice-pres. and general manager of Grace, is expected to reach its rated capacity of 150 tons a day in the very near future.

•

Chandler Joins Diamond

Appointment of Edward L. Chandler to the technical staff of Diamond Alkali Co.'s Chlorinated Products Division was announced recently.

Having already assumed his new post, Dr. Chandler will be concerned chiefly with development of new agricultural chemicals as well as technical service on Diamond's present line of insecticides, herbicides and fungicides. With headquarters at the company's research center at Painesville, Ohio, Dr. Chandler will report to Dr. L. Gordon Utter, technical service manager of the Agricultural Chemicals Department.

•

Fungicide Glossary

A list of chemical names for active ingredients of fungicides has been prepared by S.E.A. McCallan, L. P. Miller and M. A. Magill, and appears in the June, 1955 issue of *Phytopathology*. In general, the list of fungicides, which also includes seed disinfectants, soil fumigants, chemo-therapeutants, agricultural bactericides, and wood preservatives is limited to those of current interest.

•

Wheat Sanitation Stds.

Farmers who want to put wheat under the 1955 price-support program must be prepared to meet more specific standards of grain sanitation. The U. S. Department of Agriculture recently issued a bulletin describing the revised standards. This year, the Food & Drug Administration has resumed a previously suspended wheat sanitation enforcement program, which provides that wheat which, on sample test, shows more than the minimum of rodent contamination or insect damage cannot be used for human food. Under the new provisions:

(1) 1955 crop wheat must meet minimum sanitation requirements to be eligible for price-support loans.

(2) 1954-crop wheat which has been under price-support loan must meet the minimum requirements to be eligible for "reseal" loans.

•

Ga. Plant Food Soc. Confs.

The Georgia Plant Food Educational Society, Inc., together with the University of Georgia, College of Agriculture is planning a series of fertilizer conferences which will include field tours and discussions of agricultural practices which will improve the economic status of Georgia farmers.

The program for the fertilizer conferences includes the following reports: "Fertilizer Recommendations for General Crops Under Irrigation" by Ralph Johnson; "Summary of Farm Practices, Costs, etc" by farmers whose farm is featured in tour; "Installation and Utilization of Irrigation Systems," by W. E. Huston.

Tours will be made in Chipley on July 6th; Madison, July 7th; Camilla, July 13; and Statesboro, July 14th.

•

Fert. Officials to New Orleans

The Southern Feed and Fertilizer Control Officials were scheduled to hold their annual meeting June 22-24 in New Orleans. It was understood that among topics to be discussed would be a report on marketing of fertilizer solutions by oil companies in their "off-season." It was anticipated that the group might act to request that such materials be identified in the future under the term "diluted liquid fertilizers."

•

Prod. Starts At Canada Plants

Dow Chemical of Canada and North American Cyanamid Co., recently started operations at two new fertilizer plants in Ontario, Canada. The Dow installation, located at Sarnia, is rated to produce 80 tons per day of anhydrous ammonia.

North American Cyanamid's plant at Port Robinson is believed to be the first unit of its kind in Canada to produce nitrogen solutions for direct application to the soil. The company plans output of 15,000 tons to 20,000 tons this year and considerably more in following seasons.

Cyanamid Official Dies

Howard R. Huston, 62, retired vicepresident and director of American Cyanamid Co., New York, died of a heart attack last month at his summer home in Truro, Mass. Mr. Huston had been serving the company as a consultant since his retirement May 30.

Among the many positions which Mr. Huston had held with industrial organizations during his career was that of director of the National Farm Chemurgic Council. He had also served as vicepresident of that group.

With Cyanamid he had directed the company's activities in the fields of public relations and institutional advertising in the middle thirties. As an assistant to the president, he had been in charge of personnel administration and employee relations. His duties as vicepresident had commenced in 1951 and as a director in 1952. Surviving Mr. Huston are his wife and two daughters.

•

Penick Executive Retires

Harold Noble retired last month as vicepresident in charge of the insecticide division of S. B. Penick & Co., New York. Mr. Noble, 67, has been associated with Penick for 38 years. He is continuing as a member of the board of directors. Frank Seeland, who had been in active management of the insecticide division, for some time, has assumed full charge.

•

DuPont Opens Phila. Office

The Polychemicals Department of Du Pont Co., announced recently establishment of a district sales office in Philadelphia for its nitrogen products sales section. Dr. M. F. Gribbins, district manager in Chicago for the last two years, has been named manager of the office. He has been replaced in Chicago by H. Gordon Bethards, formerly a polychemicals section salesman.

Field representatives located at the new headquarters are John Spicer, Jr., Goldsboro, N. C.; R. E. Burke, Winter Park, Fla.; Sidney Taylor, transferred from Minneapolis; and George F. Stewart, New York.

The nitrogen products sales section sells "Uramite" fertilizer compound, "NuGreen" fertilizer compound, "Two-Sixty-Two" feed compound and "Uramon" ammonia liquors. The new office was scheduled to open July 1.

•

V. P. of Fert. Firm Dies

George H. Kaelin, vice president of the Long Island Produce and Fertilizer Corp. of Riverhead, L. I., died at his home in Southold, N. Y., last month after a long illness. He was 51 years old.

•

Pittsburgh Coke Names Two

Pittsburgh Coke & Chemical Co., Pittsburgh, named R. M. Marshall chairman of the board and Henry L. Hillman president, at a recent meeting of its board of directors. J. H. Hillman, Jr., was elected chairman of the finance committee.

Mr. Marshall, who joined the company in 1941 as vice president, has been president since 1947. Henry L. Hillman has served with the company since 1941, and as a vicepresident since 1950.

•

Woodbury Increases Common

An increase in the authorized common stock of Woodbury Chemical Company, St. Joseph, Missouri, manufacturer of herbicides and insecticides, to $1,000,000 has been announced by H. A. Woodbury, president of the company. Two of the firm's executives have recently taken over new responsibilities: Richard W. Douglas was named a vice-president, and Leonard R. Everett secretary.

In addition to its main offices and plant at 702 South 4th Street, the company operates a herbicide weed killer plant and an agricultural insecticide, fumigant and liquid fertilizer plant.

•

New Positions At Monsanto

Dr. J. R. Durland, St. Louis and R. S. Wobus, Monsanto, Ill., have been appointed to the newly-created positions of technical production managers of the Organic Chemicals Division of Monsanto Chemical Co., St. Louis.

McCormick Sells Agr. Line

Hy-Gro Corp., an organization recently established in Baltimore, has bought Hy-Gro Soluble Plant Food and Red Arrow Insecticides from McCormick & Co., Baltimore. President of Hy-Gro Corp. is David H. Fulton, who is also vicepresident of Plantabbs Corp., with which Hy-Gro will be affiliated. Other officers are Edward A. Hartman, vicepresident; F. Pacson Andres, vicepresident and chairman of the board; Gordon C. Murray, secretary; and W. James Price, treasurer.

Red Arrow Insecticides first were marketed by McCormick & Co., about 40 years ayo, and the Hy-Gro Soluble Plant Food was added to the line about 10 years ago. Sale to the Hy-Gro Corp. includes all manufacturing and product name rights for both products.

In announcing the transaction, Mr. Fulton stated that marketing and promotion of the products would be combined with the current Plantabbs program and that distribution would be through wholesalers to dealers and to chain stores. Red Arrow Insecticides are distributed nationally, as are Plantabbs. The Hy-Gro products are marketed regionally, but national distribution will be arranged later.

•

Fert. Section Adds Members

With addition of 24 new members during the last 18 months, membership in the Fertilizer Safety Section of the National Safety Council now totals 188, according to a recent report from the membership committee, which met at the executive committee meeting, June 12, in Roanoke, Va.

Membership is broken down into 91 key members and 97 subsidiary members. The former are located in 27 states, Canada and Formosa. In order to further the expansion of the organization, the membership committee has written 215 personal letters and mailed 450 mimeographed letters to prospective members since last October. Its efforts during the next four months will be devoted to interesting the small, individually-owned companies in National Safety Council membership.

Attention Formulators . . .

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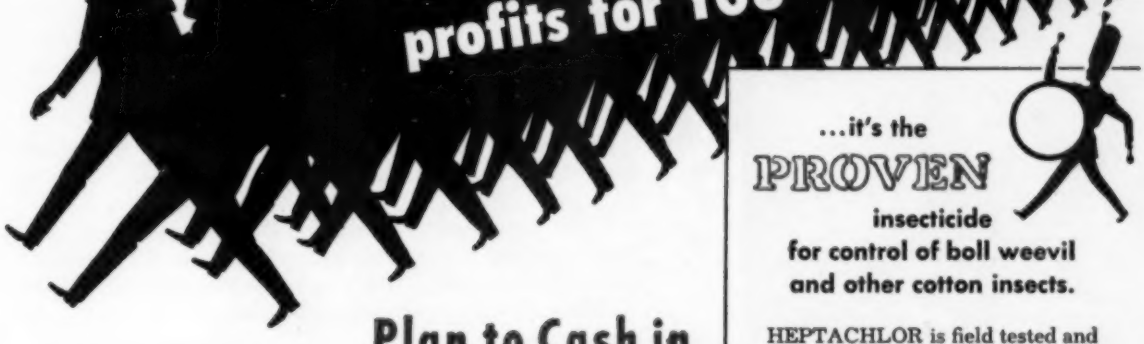
is leading the parade to bigger cotton insecticide profits for YOU



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MAGAZINES
Colorful, eye-catching ads during cotton season to prove why HEPTACHLOR can cut crop losses due to insects and can increase farmer's profits.

NEWSPAPERS
Smash ads in local newspapers giving the HEPTACHLOR story and giving cotton growers a direct pitch to buy HEPTACHLOR NOW and cut crop losses.

...it's the
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insecticide
for control of boll weevil and other cotton insects.

HEPTACHLOR is field tested and *proven* effective in the control of those cotton insects which can cost farmers up to 25% of their crop. That's why cotton farmers are enthusiastic in their acclaim for HEPTACHLOR insecticides.

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- ECONOMICAL—Only 4 oz. of actual Heptachlor per acre required.
- EASY TO USE—Can be applied with any standard equipment.
- SAFE TO USE—Safe when applied as directed.

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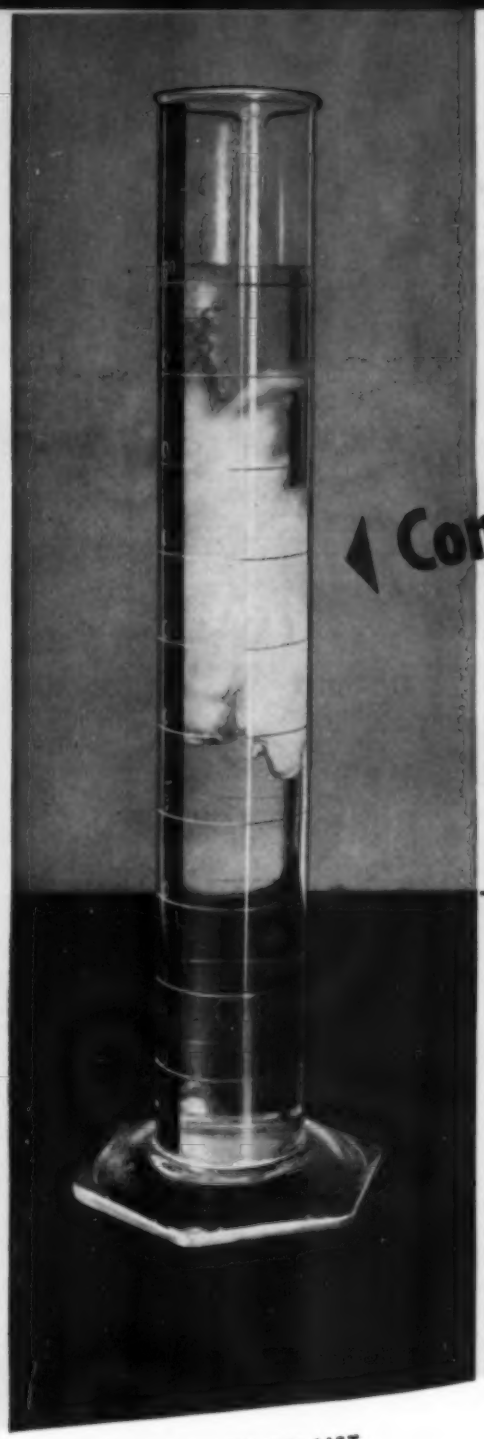

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2. Solvent used _____
3. For water hardness _____ ppm.
4. Recommended dilution _____
5. Lbs. toxicant/gal. of concentrate _____
6. Desired emulsion stability _____
7. Shelf life period expected _____
8. Ease of dispersion important? _____
9. Packaging: bulk _____ or small container _____
10. How is concentrate mixed and evaluated in laboratory tests? _____

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New Diamond Co. In Mexico

Diamond Alkali Co., Cleveland, producer and exporter of agricultural chemicals, announced last month the formation of a new firm, Insecticidas Diamond del Pacifico S. A. de C. V., to manufacture and distribute these products in Mexico. A group of Mexican businessmen, headed by Alfono Robinson Bours of Ciudad Obregon, are also participating in the new venture with Diamond holding the major interest.

President of the firm is S. S. Savage, who is also president of Diamond Alkali Inter-American Corporation and Diamond Alkali International, Inc., Diamond's export subsidiaries.

Located at Ciudad Obregon, Sonora, Insecticidas Diamond del Pacifico S. A. de C. V. is presently blending dust for cotton and other crops in western Mexico. Future plans call for building additional plant capacity, including grinding facilities for sulfur and concentrates.

The firm will also distribute in Mexico such other agricultural chemicals as weed-killers and liquid sprays, which are handled in Central and South America by Diamond Alkali Inter-American Corporation.

•

J. Sanford Retires

John E. Sanford, of Atlanta, president for the past 23 years of Armour Fertilizer Works, Inc., retired last month.

Mr. Sanford, also a vice president of the parent Armour & Co., Chicago, from 1932 until his retirement, devoted all 51 years of his business career to the fertilizer industry. He started with Tennessee Chemical Company, which was bought by Armour in 1909.

•

Pacific NW Holds Conf.

The sixth annual fertilizer conference sponsored by the Pacific Northwest Plant Food Association was held at Boise, Idaho, June 28-29-30.

The program arranged by the Soil Improvement Committee of the Association featured Dr. Roger Bray, University of Illinois, Urbana, Ill. Another highlight of the 3-day meeting was a discussion on aerial fertilization.

Field trips to the branch experiment stations at Parma and Caldwell, Idaho, Ontario, Oregon, and to the Amalgamated Sugar Co., completed the list of activities.

Charles G. Painter of the University of Idaho Extension Service at Boise, Idaho, was general chairman.

•

V-C Names Dubuque Mgr.

Glenn O. Middleton has been appointed manager of the Dubuque sales office of Virginia-Carolina Chemical Corp. Mr. Middleton joined the company in 1937 as clerk in the East St. Louis, Illinois sales office. He succeeds Harold S. Vorhes, who recently resigned to form his own company.

C. Aubrey Clayton has been named assistant manager of the Dubuque office.

•

Cripps Joins Climax

Appointment of George S. Cripps as manager of agricultural development in the chemical division of Climax Molybdenum Co., was announced last month by Dr. Charles H. Kline, manager of the division. In his new position, Mr. Cripps will study applicatons of molybdenum in agriculture.

Mr. Cripps had been with Merck & Company in the marketing department, specializing in agricultural and food processing problems, before joining Climax Molybdenum.

•

Feature Role Of Chemicals

The chemical industry's contribution to the American economy was demonstrated in the Manufacturing Chemists' Association exhibit at the How-to-Invest-Show, held May 24-30 in New York City. The section on agricultural chemicals emphasized how fertilizers and insecticides have kept the cost of food down and improved its quality and quantity. Displays illustrated the use of agricultural chemicals in greenhouses, corn and cotton fields, orchards, barns, pastures and gardens.

Agric. Engineers Meet

The American Society of Agricultural Engineers held its 48th annual meeting June 12-15 at the Illini Union Building of the University of Illinois, Urbana, Ill. Sessions were held during the four day meeting on power and machinery, rural electric, farm structures, soil and water, and education and research.

•

Grace Chair of Chemistry

Davison Chemical Co., division of W. A. Grace & Co., instituted last month a new professorship at Johns Hopkins University to be known as the "Grace Chair of Chemistry." Dr. Lowell J. Reed, one of the leading authorities in the study of catalysis, was named to fill the position, effective July 1, 1955.

•

Calspray Appoints Three

The California Spray-Chemical Corp., Richmond, Calif., recently named three scientists to its research department. They are: Edward W. Melvin, appointed as a plant physiologist-pathologist; Walter D. Thomas, named as a lead research pathologist, and Benjamin Makower, who will be a chemist with the research department.

•

WACA Advises on Credit Policy

The perils to the manufacturing chemist of an easy-credit policy were the subject of Newsletter No. 7, distributed recently by the Western Agricultural Chemicals Assn., San Jose, Calif. The letter, written by Co. A. Barnard, WACA secretary, stresses the perishable nature of pesticides, the short time that elapses between their purchase and use, and their seasonal nature. According to Mr. Barnard, manufacturers should consider these factors carefully before attempting to increase sales volume by loosening credit requirements.

In addition, Mr. Barnard's letter discussed the general economic considerations which prevail in all credit situations, particularly the availability of credit to the borrower and the need to specify the precise date that each invoice will be paid.

Walkouts In Fla. Phos. Plants

A widespread work stoppage was threatening to choke off production last month in Florida's $50,000 million a year phosphate industry. Reports early in June indicated that six plants were already on strike, with further strikes threatened at three other locations. Difficulties traced to a wage dispute. As of June 5, pickets were stationed at the plants of Armour Fertilizer Works, Bartow; Coronet Phosphate Co., Plant City, and International Minerals & Chemical Corp., Bartow. Noel Hunley, business representative of the Union, said that picketing might also commence at Virginia-Carolina Chemical Co., Nichols; American Cyanamid Co., Brewster; and American Agricultural Chemical Co., Pierce.

Two plants that were threatened with strikes after expiration of contracts on June 12, were Davison Chemical Co. and Swift & Co., both of Bartow.

•

Endrin-Parathion Stabilizer

Discovery of a stabilizing compound to permit mixtures of endrin and parathion dusts was reported last month by Velsicol Corp., Chicago. The new product, to be known as Deactivator "E" was developed by Velsicol's Research Dept., working in collaboration with American Cyanamid Co., New York.

As a result of the discovery, tobacco growers requiring endrin to kill hornworm, and parathion for aphid control will be able to obtain both insecticides formulated into a stable combination dust.

Prior to the discovery of Deactivator "E", Velsicol reported development of Deactivator "H", a product used in formulation of stable dusts containing heptachlor. Hexamethylenetetramine (HMT), previously used to stabilize endrin diluents, was found to be unsatisfactory in conjunction with parathion because it decomposed the latter compound, preventing a stable mixture.

The new product should be used only with carriers and diluents that have been tested and found satisfactory. A list of the carriers and diluents, together with formulation details is available from Velsicol Corp., Chicago, Ill., in Bulletin No. 509-2, "Suggested Formulations for Endrin-Parathion Dusts."

•

3 Stauffer Salesmen

Stauffer Chemical Co., New York, announced recently the appointment of R. F. Chenik, J. H. Knowlan and W. E. Hoskinson as sales representatives in the midwestern area. Mr. Chenik had been with Stauffer in the Texas Area, and Messrs. Knowland and Hoskinson are recent Texas A. & M. College graduates. All will be under the direction of Porter L. Williams of Stauffer's Chicago office.

R. Chenik W. Hoskinson J. Knowlan

•

Grace Advances R. Q. Parks

Robert Q. Parks was named general sales manager of Grace Chemical Co., New York. Since joining Grace Chemical in early 1953, Dr. Parks has been serving as manager of agricultural services. Prior to his association with Grace Chemical, he was head of Soil Management and Irrigation Agriculture for the U. S. Department of Agriculture in Beltsville, Maryland. He was earlier connected with the Ohio Agricultural Experiment Station at Wooster; the U. S. Plant, Soil, and Nutrition Lab at Ithaca, New York; and the USDA research division at Auburn, Alabama.

•

U. S. Potash Raises Prices

United States Potash Co., New York, has announced price increases, effective June 1, 1955 on muriate of potash and manure salts. High grade muriate of potash was raised from 36 cents per unit of K_2O to 40 cents; granular muriate of potash (59/61% K_2O) from 36 cents to 40 cents; and granular muriate of potash (60% K_2O Min.) from $26.25 to $28.65 per ton of 2,000 lbs. The price of manure salts, per unit of K_2O, was increased from 17 cents to 21 cents.

Bradley & Baker Names Rep.

The appointment of William Lee Guithues as sales representative for the St. Louis office has been announced by Bradley & Baker, New York City.

Mr. Guithues, who will cover the West North Central territory, was formerly associated with the Merchants' Exchange in St. Louis as assistant to the Secretary, and as a research chemist with Darling & Co.

•

Hold Cal. Ag. Forum

Antibiotics in crop production, chelates and their use in agriculture, and nematode control on plants were among the reports presented at the Central California Agricultural Forum, held June 7 at Fresno, Calif.

Dr. Ben Lownsbery, University of California, Davis, led off the conference with a discussion of "Nematode Control on Living Plants," followed by C. W. McBeth, Shell Development Laboratory, Modesto, Calif., who spoke on "Citrus Field Crops." Other papers read during the morning session were "Figs," Dr. R. M. Warner, Fig Institute, Fresno; "Storage and Transportation of Grapes," H. B. Richardson, University of Calif., Davis; and "Storage and Transportation of Deciduous Fruits," William Barger, U. S. D. A. Bureau of Plant Industry, Fresno.

Reports featured at the afternoon meeting were "Irrigation of Trees and Vines," L. J. Booher, University of Calif., Davis; "The Use of Antibiotics in Crop Production," J. W. Oswald, University of Calif., Berkeley; "Chelates and Their Use in Agriculture," Vernon Olney, Geigy Chemical Co., Fresno; and "The Use of Radio Active Tracers in Agriculture," Ralph March, University of California, Riverside.

J. T. Vedder, Bakersfield, Calif., is president of this years forum. Other officers are Les Stromberg, Fresno, vice-pres.; David N. Wright, Bakersfield, secretary; and George A. Myer, Fresno, treasurer. The program was under the joint direction of Vernon E. Burton, Bakersfield, and John R. Fisher, Fresno.

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Where photographic reproduction is desired.

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Entomologists To Meet

The Rocky Mountain Conference of Entomologists will hold its 26th annual meeting at the Cameron Pass 4-H Club Camp, Gould, Colo., August 9-12. Topics to be discussed will be decided by a committee meeting the first afternoon of the conference. Speakers will be drafted from those in attendance to present information and experimental data in connection with research projects. Cost of the conference per person will be $2.50 per day, plus registration.

•

Vulcan Can Founder Dies

Patrick Henry McCarthy, founder of Vulcan Stamping & Mfg. Co., and Vulcan Tin Can Co., Bellwood, Ill., manufacturers of steel shipping containers and tin cans, died June 10 at the age of 86. Born in County Limerick, Ireland, Mr. McCarthy came to the United States at the age of 13.

Stauffer Tampa Plant Enlarged

Additional facilities for the production of agricultural chemicals have been installed by Stauffer Chemical Co. at their Tampa, Fla. plant. These include modern facilities for grinding sulphur and production of insecticide concentrates. Enlarged warehouse space has also been provided in the new 13,000 foot expansion. A new control laboratory and maintenance shops have also been installed, making the Tampa unit a complete operating plant.

Scale Model Used in Planning G L F Plant

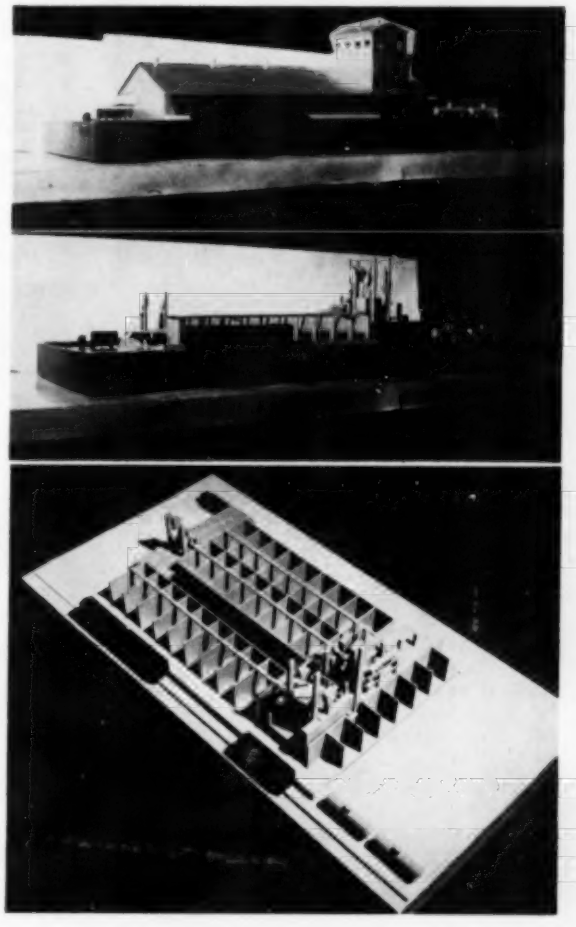
By J. E. Madigan, Ch.E., P.E.

THE decision to employ a complete scale model to help plan the new G.L.F. Granulating Fertilizer Plant at Big Flats, New York was reached by the G.L.F. Soil Building Service, Ithaca, New York and Fertilizer Engineering & Equipment Company of Green Bay, Wisconsin last fall. Accordingly Bay Industrial Models of Green Bay, Wisconsin were commissioned to furnish this model from preliminary architectural drawings.

The resulting model shown on right clearly indicates all machinery and storage area, is portable and easily carried in a suitcase. The model shows also the complete exterior of the plant, including rail road cars, trucks and ground contour lines. The interior shows the granulation and bagging machinery, bulk and bag conveyor systems, elevators and storage bins.

The new fertilizer plant will feature nine separate bucket elevators and not an elevator pit in the entire plant. The main floor is a complete open area, with all equipment located on upper floors in the mill towers. The design allows complete flexibility, with duo units for every operation through unloading, batch weighing, continuous TVA and ribbon ammoniation, granulation and bagging. As a result of this preliminary original planning, the plant will realize the optimum in new storage and efficient handling of all operations.

Fertilizer Engineering & Equipment Co. advise that the model has been of considerable help in relating all raw material receipts, machinery, storage and finished products shipments to scale. Its use simplifies visualizing plant layout and operation, and aids in developing new storage and processing techniques. They say too that with the model, they have been able to explain overall operation easily, and that the unit is invaluable as a training aid.



Top photo: Exterior view of new G. L. F. granulating fertilizer plant.

Center photo: Exterior shell of model is removed to show machinery within.

Bottom photo: Top view, with shell removed shows 27 bulk headed bins, the overhead tripper conveyor system, the shipping unit at the far end and the complete granulation unit with the hopper system and TVA ammoniators at the near end.

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Modern, Efficient Plants and Equipment

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Representatives in the following cities: New York, N. Y., Chicago, Ill., Minneapolis, Minn., Kansas City, Mo., Cleveland, Ohio, Atlanta, Ga., Baltimore, Md., Dallas, Texas, Charlotte, N. C., Ligonier, Pa., Bluefield, Va.

Pacific Northwest Holds Fertilizer Conference

THE requirements of Northwest soil; fertilization of beets, potatoes, alfalfa, etc; use of liquid fertilizers; fertilizer technology and economics, were among the topics studied and reviewed at the sixth annual Northwest Fertilizer Conference held June 28-30 at Boise Hotel, Boise, Idaho. The meeting is sponsored jointly by the state agricultural institutions of Idaho, Oregon and Washington; and the Soil Improvement Committee of the Pacific Northwest Plant Food Association.

Fertilizer Requirements

J. L. Haddock, USDA, reminded the group that growers should look to a scientific basis from which to determine the fertilizer requirements for their crops. He indicated, however, that additional research is still needed on soil analysis and plant tissue analysis in relation to crop response to provide a sound basis for plant nutrition.

In connection with fertilization of sugar beets, T. Gessel, Amalgamated Sugar Co., advised that there is very little potash being used on sugar beets at present. "Through tests where potash has been used," he said, "we have found no apparent advantage either in quality or tonnage. At present we are striving to retain every bit of organic matter, along with using balanced fertilizer practice to obtain the maximum yield, without depressing the sugar."

L. I Painter, Univ. of Idaho, reported that trials carried out since 1949 have shown that N and P are the two limiting nutrient elements in potato production. Potassium fertilizers have not been beneficial, he said, unless extremely high applications of N and P_2O_5 were made. In general, he said, applications of N or P_2O_5 greater than 80 pounds an acre have not been justified in terms of saleable tubers produced.

Nitrogen is the main nutrient needed in fertilizing wheat in the pacific northwest, according to G. O. Baker, Univ. of Idaho. There are indications that phosphorus and/or sulfur are needed in some areas, he indicated . . . but this would indicate that increasing yields by the use of nitrogen may result in other nutrients becoming a limiting factor in such areas.

Liquid Fertilizers

K. D. Jacob, USDA, advised the conference that liquid anhydrous ammonia and the so-called nitrogen solutions account presently for some 40 per cent of the total use of fertilizer nitrogen. Consumption of these materials directly in the manufacture of solid mixed fertilizers has grown, he said, to the extent that they now supply about half the nitrogen in such fertilizers. They also supply about a third of the nitrogen used for direct application. Considerable expansion in the direct application of ammonium phosphate solutions is expected for at least some of the western states.

In eastern Oregon, tests on several farms showed a response to nitro-

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gen, but only two farms gave a phosphorus response. Soil testing results in Idaho have shown a need for nitrogen and phosphorus on many soils in the southern part of the state; while some acid soils showed a deficiency in potash. G. Lewis, Idaho and L. A. Alban, Oregon, presented some of the correlation test data.

G. B. Wood, Oregon State College, discussed the economics of fertilizer use in agriculture; while D. Tate, Triangle Dairy, gave a case history of a dairy farmer in the soil fertility program. Other papers on aerial application of fertilizers, industrial and agricultural applications of atomic energy, and nutrient surveys were presented by H. Hansen, A. Lee, and N. Benson, respectively.

•

Gallowhur Licenses du Pont

Gallowhur Chemical Corp., Ossining, New York, recently announced the licensing of E. I. du Pont Nemours & Co., Wilmington, to manufacture solutions containing phenyl mercury acetate under U. S. Reissue Patent No. 23,863 for use in liquid seed disinfectants.

•

Western Potash Borrows 17.5m

Western Potash Corp., Ltd., Calgary, Alberta, Can., has completed $17,500,000 of financing for development of Saskatchewan potash reserves. Present plans call for an issue of 10,000,000 shares of stock, which have been underwritten, and sale of $11,000,000 of debentures. F. H. McGraw & Co., and a group of Canadian and American financial concerns will carry out the plan. At a special meeting last month, stockholders voted to name the concern Continental Potash Corp.

•

India Plans Fert. Plants

Sources close to the Indian government have reported that there are plans to eliminate the acute fertilizer shortage in that country through construction of three fertilizer plants as part of the second five-year-plan, which is scheduled to get under way April 1, 1956.

According to the Foodgrains Committee, India's annual fertilizer needs are approximately three million tons. At present, 350,000 tons per year are produced through the gypsum process at Sindri in Bihar State, with the country relying on imports to fill the rest of its quota.

It is believed that when the five year plan commences, in addition to construction of new plants, activities at Sindri will be expanded to include manufacture of soda ash, ammonium nitrate, urea, hexamin and nitroline.

•

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Five alpha-substituted naphthalenes, for use as intermediates in agricultural chemicals and other products, are being marketed by Millmaster Chemical Corp., selling agents, and F. O. Cockerille, manufacturer, Greenwood, Va. The derivatives are alpha-Naphthalenemethanol (alpha-Naphthyl Carbinol), alpha-Naphthaldehyde, alpha-Naphthaleneacetonitrile, and alpha-Naphthaleneacetamide.

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Trullinger Retires from USDA

The retirement of Dr. Robert W. Trullinger as assistant administrator for experiment stations, Agricultural Research Service, was announced last month. Dr. E. C. Elting, deputy to Dr. Trullinger, is designated acting assistant administrator. A leading advocate of close cooperation between the States and the Federal government in agricultural research, and between research and extension workers for improvement of the Nation's agriculture, Dr. Trullinger has had a distinguished career of 43 years' service in the Department.

•

To Build Canada Fert. Plant

Construction of $23,000,000 million fertilizer plant at Medicine Hat, Alberta, Canada, was slated to commence late in June, for Northwest Nitro-Chemicals, Ltd. The plant will produce high analysis nitrogen and phosphate chemical fertilizers processed from natural gas. Production is expected to begin late in 1956. Northwest Nitro Chemicals, a Canadian subsidiary of Commercial Solvents Corp., New York, will operate the plant under a long-term management contract.

•

Change In Fert. Labeling

A simplified method of reporting nutrient content of fertilizers has been recommended to industry by the Soil Science Society of America as a result of a polling of American soil scientists in which 95 per cent voted in favor of the proposed change.

The change would require that labels state the content of all plant nutrients in the elemental form—as is now true with nitrogen—rather than in the oxide form now used for phosphorous, potassium and certain other nutrient elements. Advantages claimed for the new method are that it would permit greater uniformity of reporting nutrient content, would simplify terminology, and allow accurate expression of fertilizer ratios. (Under the present system, a fertilizer ratio of 1:2:0 implies that twice as much phosphorus as nitrogen is being used. Actually, the ratio is only 1:0.88:0—when all nutrients are expressed on a uniform elemental basis.) Furthermore, the method is already in use in animal nutrition and in the feed industry, as well as in soil testing.

Objections raised against the proposed change concern the problems connected with revising fertilizer laws on a national scale and in educating all groups to the new system.

New Delaware Mfrs.

Brandt & Gardner Fertilizer, Inc., was recently incorporated at Dover, Del., with authorized capital stock of 500 shares at no par value. Prentiss-Hall Corp. System, Inc., is serving as the principal office. Houston Sulphur Corp. has also filed a charter of incorporation at Dover with a capital stock investment of $25,000.

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LISTENING *Post*

Effect of Lead Treatment on Bean Rot in Wyoming

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

H. J. WALTERS of the Wyoming Agricultural Experiment Station reports that rot causes much concern to bean growers in Wyoming, where the crop is grown under irrigation. The most important of the several different organisms that may cause root rot are species of *Fusarium*.

Seed treatment tests were conducted with three varieties of beans to ascertain the effect of certain compounds in the development of root rot and on resulting yields. In 1950, compounds used for seed treatment were applied as dusts but results were not satisfactory. From 1950 to 1953, methocel (methylcellulose) was used as a sticker for treatments with all fungicides, except Dow 9B with which it is not compatible. Compounds were used at the following rates per 100 pounds of seed: Arasan—8 oz., Ceresan—2 oz., Spergon—8 oz., Dow 9B—2 oz., Dithane Z78—8 oz., and I & D (Arasan and Lindane)—3 oz.

Treated beans were planted during the last week of May in soil heavily infested with root-rotting organisms. Each test consisted of four 25-foot rows replicated four times.

Root-rot readings were made during the second week in August. Ten plants were pulled at random from each of the outside rows of each plot, and the root systems of the plants were ranked in groups numbered from 0 to 4 acording to severity of disease. A disease index was prepared by multiplying the number of plants in each group by the number of the group. After the index for each replication was obtained, the mean for the four replications was calculated. The index number is directly correlated with severity of root rot: i.e., the higher the index number, the more severe the disease.

Yield data were taken from the two middle rows of each 4-row plot.

There was no direct correlation between treatment and severity of root rot or yield. The disease index of treatments was significantly lower than that of the checks in only a few cases (Table 1). Also, severity of root rot was not correlated with yield. In several cases treatments showing the highest index for root rot produced yields as good as or better than other treatments. None of the treatments resulted in increased yields significant at the 5% point over the check (Table 2).

Results for one year in which Spergon and Dow 9B were included are not given in the tables. Severity of root rot was not significantly lower nor were yields significantly higher than the checks.

Seed treatment with I & D in 1951 decreased yields, probably owing to too heavy application of the material, resulting in reduced stands and retardation of growth. Lighter applications of the fungicide used in 1952 and 1953 gave increased yields.

The various seed treatments did not show any definite control of the root-rotting organisms. *Fusarium* spp. are practically always present in the soil and usually attack plants after they are past the seedling stage, so that a quantity of fungicide sufficient to prevent infection of bean plants cannot be supplied through seed treatment.★★

TABLE 1.

Root-rot index[a] of three varieties of beans after seed treatment with various fungicides.

Treatment	Great Northern UI[b] 16			Great Northern UI 123		Pinto UI 78		
	1950	1952	1953	1950	1951	1950	1951	1952
Arasan	71	53	51	64	35	61	51	44
Ceresan	71	.....	.....	75	32	61	31	—
Dithane Z78	56[c]	58	45	65	35	54	43	43
Captan	—	51	54	—	—	—	—	43
I & D	.....	60	50	—	37	—	37	37
Check	70	58	57	67	43	61	36	42

[a]The higher the index number, the more severe the disease.
[b]UI refers to varieties developed by the University of Idaho.
[c]Underlined figures are significantly lower than check at the 5% point.

TABLE 2.

Pounds of beans produced per acre with three varieties of beans after seed treatment with various fungicides for control of root rot.

Treatment	Great Northern UI[a]			Great Northern UI 123		Pinto UI 78		
	1950	1952	1953	1950	1951	1950	1951	1952
Arasan	1650	1618	1918	1761	1672	1253	2047	1823
Ceresan	1478	.....	.....	1699	1601	1935	2232	.....
Dithane Z78	1315	1561	1788	1749	1821	2232	2267	1975
Captan	.....	1642	1856	.....	.....	.....	.....	2071
I & D	.....	1561	1856	.....	1268	.....	1960	2251
Check	1674	1704	1865	1401	1601	1662	2047	2071

[a]UI refers to varieties developed by the University of Idaho.

Yellow Clover Aphid, Armyworm, Corn Borer Pose Threat

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Economic Insect Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

THE citrus blackfly, which until May 31, was not known to be in the continental United States, was found in Brownsville, Tex., on that date. The infestation was found on a single lime tree on the grounds of a tourist court located near the city limits on the Harlingen Highway. There are no commercial citrus groves in the immediate area. The find consisted of egg spirals and unemerged pupae on two leaves of the tree involved. An intensive survey had, to the time of writing this report, failed to reveal any additional infestations in the area. A cooperative eradication spray program immediately was undertaken. State, federal and industry officials are cooperating in this program. Prior to this find the citrus blackfly was known to be in Mexico, Central America, the West Indies, Cuba, the Philippines, China and India.

The Mediterranean fruit fly, a serious pest of citrus and one of the few insects known to have been eradicated in the continental United States, again has been found on the North American continent. This insect recently was reported in Costa Rica, where it was found established in the central plateau on an area of approximately 30 to 70 kilometers. Infestations were found to be heavy in peaches and moderate in oranges and other citrus. The Mediterranean fruit fly has a wide variety of hosts among which are many citrus and deciduous fruits, including oranges, grapefruit, peaches, apples, plums, pears, and about 100 other cultivated and wild fruits. The pest was found in Florida in 1929 and an intensive control program aimed at eradication was launched. The program was successful with no specimens having been found in Florida since July 1930.

The vegetable weevil, one of the important vegetable insects in this country, has been reported in Kentucky and Missouri. This insect was found first in the United States in Stone County, Miss., in 1922. With the exception of California, where the weevil was reported in 1925, the pest for several years confined its damage to a limited section adjacent to the Gulf of Mexico. The weevil, thought for years to be confined to the Southern States and California, gradually has spread in area, reaching southern Virginia in 1945 and Maryland in 1952. For several years after discovery of the insect in this country, the principal vegetables attacked were those such as turnips, carrots, tomatoes, potatoes and cabbage. Since that time it has become a pest of practically all vegetables, as well as tobacco and certain flowers. As in the case of all insects, clean culture is beneficial in helping to keep down the population of vegetable weevils. A recommended control is application of five per cent DDT dust or spray to the soil and a one per cent rotenone dust or spray to infested plants. Farmers should not apply DDT to parts of the plants that are to be eaten unless they are certain the residue can and will be removed by washing or stripping.

The alfalfa weevil, first reported found in the eastern part of the United States, in Maryland in 1952, and since reported in Delaware, New Jersey, Pennsylvania, West Virginia and Virginia, in early June was reported in North Carolina and Washington. The insect was reported from Granville and Vance counties, North Carolina and from Asotin County, Washington. The North Carolina infestations yielded slightly over six larvae per 100 sweeps, while specimens from Washington were collected from roadside alfalfa.

General Insect Activity

During the latter part of May and early June grasshoppers were among the insects causing most concern. In New Mexico grasshoppers were the primary concern, with infestations on more than 1,000,000 acres as of early June with the expectation that the area would become larger. Of the known infested area 750,000 acres were in Lea and Chaves Counties. In Quay County near Nara Visa an estimated area of 40,000 acres had an average population of 50 grasshoppers per square yard. Economic infestations were also present on large acreages in Roosevelt, Union, Colfax, Harding and Dona Ana Counties. Cooperative control programs have been initiated in several of the infested areas. In Texas widespread infestations ranging from medium to heavy were reported from the north-central area to the Oklahoma line. Missouri is facing a severe situation, with populations higher than at this time last year. Populations in field margins ranged up to 300-400 per square yard, with alfalfa being more heavily damaged of the crops attacked. In Oklahoma, 20 to 70 per square yard, were appearing in the western area. The heaviest infestations in that State appeared to be in Jackson and Comanche Counties. Other States reporting either threatening or damaging populations in some areas included Utah, Arkansas, Kansas, Illinois, Nebraska, and South Dakota.

Damage by small European corn borers was appearing extensively in corn in Delaware early in the month, and egg masses of the pest were reported in several States. Egg counts on tallest corn in Illinois averaged 200 per 100 plants, while Ohio had 20 masses per 100 plants on early corn, and central Iowa 55 masses per 100 plants. It was predicted that hatching would be general in the central area of Iowa by June 10 and in northern parts of that State by June

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18. Hatching was occurring in Massachusetts and treatment was required in early fields. Alabama reported damage by this insect to corn in Cullman, Morgan, and Marshall Counties. This is believed to be the first economic damage to corn by this insect in this State. By early June also, pupation was complete or nearly so in Nebraska, South Dakota, and Missouri. Borer development was reported to be earlier than normal in several areas, with activity approximately two weeks ahead of schedule in Illinois.

Although the armyworm had caused widespread damage in some areas, especially Georgia, North Carolina, Missouri and Kansas, the situation as a whole was not as serious up to June 10 as in the preceding two years. By that date also, the infestations were clearing up as far north as Tennessee and central Missouri. The yellow clover aphid attack on alfalfa was also subsiding in Arizona and Oklahoma but New Mexico still reported serious populations in the southern half of the State.★★

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Safety Award To Am. Potash

American Potash & Chemical Corp., Los Angeles, received the Lammot du Pont Safety Plaque award for plants working more than 2,000,000 man-hours annually at the recent meeting of the Manufacturing Chemist's Assoc., White Sulphur Springs, W. Va. The plaque is given to chemical companies showing the highest rate of improvement in plant safety over a five-year period. Runner-up was Stauffer Chemical Co., New York.

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Control For Birch Leaf Miner

The Connecticut Agricultural Experiment Station reports successful use of malathion in control of the birch leaf-mining sawfly. Experiments by John C. Schread show that sprays of malathion will effectively control the second brood of sawflies if applied during the last week in June. The spray may be followed, if necessary, by a second application 10 days to 2 weeks after the first. Application of 57 per cent malathion emulsion at the rate of 1 to 2 teaspoons in 1 gallon of water should give effective control.

•

Texas Reps For Fulton

Fulton Bag & Cotton Mills announces the appointment of William Roy Blackburn and Alvie Martin Strickland as sales representatives in the Texas area. Fulton's Dallas branch is under the management of T. R. Berry and is located at 4301 So. Fitzhugh at Gaisford, Dallas, Texas.

CSC Settles Suit

A law suit involving Chemical Construction Corp., New York and Texas City Chemicals, Inc., filed April, 1954, was settled last month to the satisfaction of both parties. The suit concerned a contract under which Chemical Construction Corp. was to design and construct for Texas City Chemicals, at Texas City, a dicalcium phosphate plant, a sulfuric acid plant and facilities for the recovery of uranium from phosphate rock.

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NEWS Brevities

ROBERT J. MUSSER has been appointed assistant manager of the market research department, Carbide and Carbon Chemicals Co., New York.

* * *

THE CHEMICAL MARKET RESEARCH ASSOCIATION held its 1955 annual meeting at the Plaza Hotel, New York, May 19, discussing the theme "What's Ahead for Chemicals?"

* * *

CHARLES M. POWELL, president of The American Agricultural Chemical Company, New York, received the honorary degree of doctor of laws, for service in the interest of conservation at commencement exercises of the University of Massachusetts last month.

* * *

STAUFFER R-242 has recently been named "Sulphenone." It is not to be confused with the term "Sulfenone" used by Lester W. Hanna for an insecticide and fungicide.

* * *

DR. LAWRENCE L. LACHAT, former head of biochemical market development of Armour and Co., Chicago, recently announced formation of a private consultation service and manufacturers agency.

* * *

FULTON BAG & COTTON MILLS, New Orleans, recently named Charles Richard Bronaugh to their Kansas City office as sales representative.

* * *

UNION BAG AND PAPER CORP., announced recently the appointment of E. L. Corrent as multiwall bag sales representative for the Rocky Mountain States. He will headquarter in the company's Denver office.

P. F. GUNDER AND JAMES A. LONG, JR., have joined the research and development division of the Davison Chemical Co., Div. of W. R. Grace & Co., Baltimore.

* * *

ST. REGIS PAPER CO., New York, announces that the Chicago sales offices of its various Divisions have been consolidated, together with the Chicago Traffic Department, at a new location at 18 South Michigan Avenue.

* * *

WEST END CHEMICAL CO., Oakland, Calif., recently announced discovery and acquisition of a pure lime rock deposit at Inyo County, Cal. The company plans to transfer its quarry operations to the new site.

* * *

SHARPLES CHEMICALS INC., a Philadelphia subsidiary of Pennsylvania Salt Mfg. Co., now is supplying commercial quantities of thiophene for use in the manufacture of dyes and chemicals. Thiophene is expected soon to be widely used in agricultural chemicals, according to the company.

* * *

BRUCE B. MINER, editor and advertising manager of the Merrimack Farmers' Exchange, Concord, N. H., has been named editor at the Connecticut Agricultural Experiment Station, New Haven, replacing Miss Amanda Quackenbush, who recently resigned.

* * *

THE AMMONIA CHEMICAL CORP. OF CALIFORNIA reports it will start construction of a $3,250,000 anhydrous ammonia plant south of Merced, Cal. Ammonia from nearby gas wells will be used in the manufacturing of fertilizer.

FRED M. MOFFAT, JR. has been elected a vice president of Mexican Gulf Sulphur Co. Mr. Moffat formerly was a director of the dies and chemicals export department of American Cyanamid Co.

* * *

JEFFERSON CHEMICAL CO., INC., New York, recently named George T. Plunkett treasurer and Edgar H. Bohle assistant to the president.

* * *

NEIL F. MCCANN, agricultural advisor to the British Embassy in Washington, D. C., last month made a four-day tour of the facilities of Maine Agricultural Experiment Station, at Monmouth, and the University of Maine.

* * *

AMERICAN CYANAMID CO.'s Latrobe, and New Castle, Pa., plants were presented five safety awards in May by the National Safety Council, the Manufacturing Chemists Association, and the Pennsylvania Department of Labor and Industry.

* * *

G. DANIEL DAVIS has been named executive vicepresident of Nopco Chemical Co., Harrison, N. J., manufacturers of synthetic organic chemicals and processing specialties for the fertilizer trade and other industries.

* * *

WILLIAM P. DRAKE was appointed last month to succeed George B. Beitzel as president of Pennsylvania Salt Mfg. Co., effective July 1. Mr. Beitzel is continuing as a member of the board and will also serve as chairman of the board for Pennsalt International Corp., a subsidiary.

* * *

PITTSBURGH COKE & CHEMICAL CO., Pittsburgh, Pa., announced last month the appointment of Stanford Adams as sales representative to the Dallas office of the company's Agricultural Chemicals Division.

* * *

AMERICAN AGRICULTURAL CHEMICAL CO., New York, announced recently the appointment of D. S. Parham as general superintendent in charge of fertilizer production.

THE NATIONAL COTTON COUNCIL will assist friendly foreign nations in developing market research and sales promotion programs for cotton textiles under terms of an agreement announced last month by the Council and the U. S. Department of Agriculture.

•

CHARLES H. KLINE has been named manager of the newly created chemical development division of Climax Molybdenum Co., New York.

New Address for NPFI

The newly organized National Plant Food Institute (consolidation of NFA and APFC) will be located at 1700 K St. N.W., Washington, 6, D. C. Phone DIstrict 7022?. *See story page 36.*

•

Parasites In Cattle

A discussion on the control of internal parasites in cattle . . . particularly dairy cattle, was held June 30th at E. I. du Pont de Nemours Co., Wilmington, Del. Drs. A. C. Todd, University of Wisconsin, and A. O. Foster, USDA, reviewed the use of phenothiazine in control of this problem.

•

Safety Congress In Oct.

A round table discussion of "Safety Musts," wil highlight the fertilizer section meetings at the 43rd Annual Safety Congress to be held Oct. 17-21 at Chicago. The panel will report on mechanical guards, conveying devices, fire protection, liquid nitrogen, fertilizer-insecticide mixing problems, safety rules, and electrical hazards. Included among the speakers will be C. L. McDaniel, Lion Oil Co., El Dorado, Ark., discussing liquid nitrogen, and Robert Henry, Willson Products, Inc., Reading, Pa., who will speak on fertilizer-insecticide mixing problems.

The report of the general chairman, Thomas J. Clarke, G. L. F. Soil Building Service, Ithaca, New York will open the first fertilizer section meeting, Oct. 17. Following will be the report of the nominating committee and the election of 1955-56 officers.

•

Plant Uses New Dorr Process

High analysis complete plant foods are in full production at the new Missouri Farmers Association granular fertilizer plant near Joplin, Missouri. Using a newly developed Dorr process to produce diammonium phosphate, MFA has become the first company to make such concentrated granular fertilizers. The five million dollar plant, designed by Dorr-Oliver Inc., Stamford, Conn., has a capacity of 200 tons per day.

Principal products to date have been 14-14-14, 14-28-14 and 12-36-12 compounds. In addition, since the plant has been in operation, 11-48-0, 16-20-0, 19-19-0 and 13-39-0 compounds have also been produced. By means of this new process an almost infinite variety of high-grade, concentrated granular fertilizers may be manufactured, depending upon the ratio in which sulfuric and phosphoric acids are combined with phosphate rock and ammonia.

Triangle Brand Copper Sulphate has been recognized as an effective agricultural chemical for more than sixty years. In sprays (where Bordeaux mixtures are the most reliable), in dusts (if you prefer them) and in fertilizers (for additional enrichment of the soil) Triangle Brand Copper Sulphate has proved itself worthy and dependable. Try these Triangle Brand forms of Copper Sulphate:—

INSTANT (powder) for quick and efficient mixing of Bordeaux sprays.

SUPERFINE (snow), SMALL or LARGE CRYSTALS, all containing 25.2% metallic copper.

BASIC Copper Sulphate in powder form, containing 53% metallic copper.

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Suppliers' BULLETINS

DiMet for Crabgrass

Promising control of crab grass . . . Digitaria sanguinalis and D. ischaemum . . . is suggested with use of disodium monomethyl arsonate hydrated. The compound is offered in liquid and powder form as "DiMet" by the O. E. Linck Co., Clifton, N. J. The herbicide is suggested also for control of Dallas grass, Nut grass, Goose grass, and chickweed.

•

Armour Buln. On Emulsifiers

A technical bulletin outlining the emulsifiers made by the chemical division of Armour and Co., Chicago, is being offered emulsion technologists. The 12-page pamphlet describes the properties of 24 classifications of Armour emulsifiers, which give users a wide choice of compounds for the safe and economical means of combining water with waxes, solvents, silicones, resins and oils. A copy of the pamphlet may be obtained by writing for Technical Bulletin F-2.

•

Seed Treatment Folder

A new six-page folder on how to treat seed with heptachlor has been published by the Velsicol Corp., Chicago. The folder, demonstrates how heptachlor is used, when to treat seed, how to treat seed. A table shows the rates of application for standard formulations for wireworms, seed corn maggots, southern corn rootworm, and sugar beet root maggots.

•

Iron Chelate Bulletin

A bulletin describing "Perma Green Iron 135" was issued last month by Refined Products Corp., Lyndhurst, N. J. The pamphlet contains a table of recommended applications and describes briefly the function of chelates. Colored photographs comparing treated and untreated vegetation are included, along with photographs illustrating the symptoms of the various chelate deficiencies.

•

CSC Data Sheet

"CSC Metaldehyde," a compound for control of slugs and snails, is described in technical data sheet No. 2, issued recently by Commercial Solvents Corp., New York. The report lists specifications and properties, and gives information on toxicity, storage and handling.

•

Chase Has Aid For Baggers

A new inventory aid for use with multiwall bags has been announced by Chase Bag Co., Chicago. A smooth-finish tape in a wide variety of colors is sewn across the bottoms of multiwall bags as a closing tape, serving as a ready identification of the bag contents when bags are stacked and the printed surface is not visible. The new product is called "Flattertape."

•

Report On Pyronyl 75

Prentiss Drug & Chemical Co., Inc., New York, has just published an information bulletin on Prentox Pyronyl "75", an oil-free pyronyl concentrate. The new product is the latest development in the field of pyrethrum insecticides, incorporating the rapid killing power and complete freedom from toxicity of pyrethrum and the stabilizing and insect repellant activity of piperonyl butoxide. It contains no kerosene, no odorless base oil, nor any other solvent.

The most important area for the use of Prentox Pyronyl "75" will be in the field of grain protection.

Corn Production Folder

A new four-color folder entitled "You Can Grow Profitable Corn This Year" is now being distributed by the Middle West Soil Improvement Committee for sales promotion and educational use. The committee is distributing copies of the folder to vocational agriculture teachers, county agents, extension workers, SCS personnel and other groups in the Corn Belt.

The eight-page folder uses pictures, graphs and charts to point up these factors in profitable corn production.

1—The role of high yields in cutting the cost of production per acre; 2—The amount of plant nutrients needed to get those high yields; 3—The rate at which nutrients must be made available during the summer; 4—The methods by which the nutrients can be applied.

In addition, the folder visualizes some of the common hunger signs that show on the leaves and ears of corn plants and stresses the need for efficient control of weeds, insects and diseases, if high yields are to be obtained.

•

Exact Weight Buln.

Exact Weight Scale Co. Columbus, O., offers several 2-color bulletins describing their line of weighing and sacking scales for use in the fertilizer field. Automatic and semi-automatic equipment are described. The Exact Weight sacking scales bag, weigh and checkweigh at the same time; they may be used with multiwall paper lined cotton or burlap bags.

•

New NPFI Bulletins

With the organization of the newly formed National Plant Food Institute were announced two new association publications. The weekly *News Report* had its first issue June 10, 1955. Del Rucker is editor, and P. C. Crolins is managing editor.

A second new publication *Plant Food Review*, combines the former *National Fertilizer Review* and the *Plant Food Journal*. It will be issued quarterly, and like the weekly news report will be distributed to NPFI members.

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Allen Heads ACP Agr. Div.

William Allen has been named chemical director of the agricultural chemicals division of American Chemical Paint Co., Ambler, Pa. J. M. F. Leaper has been appointed senior scientist in the division.

•

To Manage Bemis Div.

A. D. Hoeppner has been appointed manager of the Flexible Package Co., Chicago, subsidiary of Bemis Bro. Bag Co., St. Louis. Flexible Package Co., makes polyethylene bags.

MILLER BILL

(*From Page 53*)

termining the ultimate role of particular chemicals in our production of raw agricultural commodities.

Residue Research Facilities Inadequate

It seems safe to say that in the majority of experiment stations adequate chemical analytical help for the determination of pesticide residues is lacking, or is only partially effective. To express it another way, perhaps one might name those laboratories on the fingers of one hand where anywhere near adequate financial support has been given to pesticide residue research. This is in no way intended as a criticism, inasmuch as most publicly supported institutions have faced rather rigid economy in their budgets. Without the incentive of definite federal legislation, it was difficult if not impossible, for administrators to obtain funds for the development of pesticide residue research.

Fortunately, in many instances, industry came to the rescue and provided grant funds to assist in the work with particular products. In addition, industry has been helpful in running residue analyses in its various laboratories from samples provided by the various experiment stations. One might observe that the cooperation begun in this informal manner is a 'life-saver' at present for making extension recommendations. It points also to the closer relationship between industry and public institutions, since both are working toward the same objective—better pest control with safety to the public.

Research Procedures May Change

Provision is made under the Miller Bill for experimental tolerances for new products. It would seem that the requirements are nearly as inclusive for an experimental tolerance, however, as for actual registration. In the past many companies provided the experimental stations with new products soon after they had completed their laboratory screening, but before they had been proved in field experimentation. The data may not be sufficiently complete on chronic toxicity, residues at harvest, or some other phase of the program to permit an experimental tolerance. Yet the company developing the products needs field pest control data to evaluate the potential value of the compound before deciding to invest in the animal data and so forth.

Many stations have conducted cooperative research with industry and growers, and have included limited work with these potential compounds. It would seem under present legislation, however, one should take care in experimenting with chemicals for which tolerances have not been established, or exemptions announced, unless it is possible to keep the treated produce out of channels intended for public consumption.

Although it is obvious that curtailment of research and development was not intended by the Miller Bill, we need to re-evaluate our past procedures for the so-called 'test-tube' stage of research. Greater care must be exercised in grower-cooperative experiments to watch the ultimate disposition of the crop unless the material is cleared with an experimental tolerance, an official tolerance or exemption from tolerance requirement. Perhaps this phase of our research program can be further clarified before another season rolls along.★★

Correction!

The report on spray nozzle tests, page 89 of the June issue of "Agricultural Chemicals" incorrectly stated that higher yields were pro-

duced from plots treated with a fan-shaped pattern. This item should have read that the higher yields were produced on plots treated with a hollow-cone spray pattern.

N. P. F. I. MEETING

(*From Page 40*)

tures is practical under certain limited conditions."

Concluding his report to the Institute, Mr. Berry confirmed the remark of Mr. Bailey, in saying that the only claim supporting the use of fertilizer—pesticide mixtures which is not controversial, is that based on the economics of the practice. "I predict," he said, "that the general use of these mixtures will necessitate more laws and regulations."

F-P Mixtures in '53-'54

A COMPLETE report on the use of fertilizer-pesticide mixtures in the United States was presented by K. D. Jacob, who estimated that in the year ended June 30, 1953, consumption of F-P mixtures in the U.S. and territories totaled about 87,000 short tons; that in 1954 this figure increased 71.4% to total 149,100 tons. These figures relate chiefly if not entirely to solid products, he said, although liquid mixtures of fertilizers and pesticides may find some use.

In 1953-54, aldrin was the insecticide used in the largest total quantity in mixture with fertilizers. Chlordane ranked second, and DDT was probably third. Arsenicals, BHC, dieldrin, heptachlor, lindane, and toxaphene were among the compounds used in still smaller quantities. 2,4-D was the principal herbicidal constituent of the mixtures.

Dr. Jacob reported that "although information on the quantities of fertilizer-pesticide mixtures applied to various crops is quite incomplete, the total quantity of such mixtures used for controlling insect pests of corn, chiefly corn rootworms, wireworms, and the seed-corn maggot, was undoubtedly much greater than that for any other crop. It is estimated that corn received more than 50% of the tonnage of fertilizer-pesticide mixtures in 1953-54. Most of the remainder was applied to potatoes, sugarcane (in Puerto Rico), and vegetables.

"Corn rootworms and wireworms—attacking corn, potatoes, and other crops—were the chief pests controlled by fertilizer-pesticide mixtures. Control of these pests was probably an objective of at least two-thirds of the tonnage of the mixtures used in 1953-54."

For the country as a whole, Mr. Jacob advised that the outlook "is promising for continued growth in the use of fertilizer-pesticide mixtures. Expanded consumption is expected in 32 of the states, especially those comprising the North Central region. Increases are anticipated for all states in the Pacific and South Atlantic regions and for many of the states in the other regions except the West South Central. Even in this region it would not be surprising if further research leads to increased use of the mixtures. Whereas the consumption trend is said to be un-

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with air-operated valve

BETTER CONTROL — SMOOTHER OPERATION are the features of this EXACT WEIGHT sacker. It is semi-automatic — operator pushes button to start cycle. Air-operated valve closes automatically from bulk to trickle feed and cuts off positively at correct weight. Precision-sensitive scale with visible indication of 1" travel for 8 ounces weight, permits infinite adjustment. Exact Weight scales with automatic controls available from 200 lbs. capacity down to a few grams.

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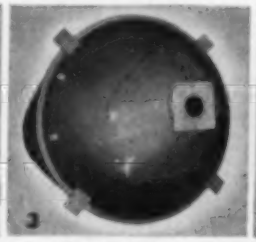
HAVE YOU OVERLOOKED ANY OF THESE IDEAS?

There are places in your fertilizer plants where low-cost Johnson accessories can profitably increase the efficiency of your bulk-material storage, batching and blending operations . . .

1 **Pivoted Distributor**
feeds materials to multiple-section bins. Turns, locks by ground-level control.

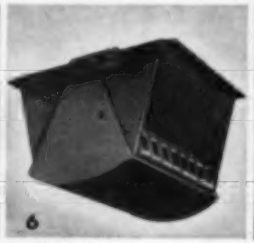
2 **Rotary Vane Compressor**
supplies 7 cu. ft. air pressure per min. to aerate silos, bins. 15-lb. limit-relief valve.



3 **Aeration Fittings**
properly spaced in storage bins and silos keep bulk materials fluid, free-flowing.

4 **Bin Gauges and Signals**
accurately register "hi-lo-levels". Automatic. Water and dust-proof.

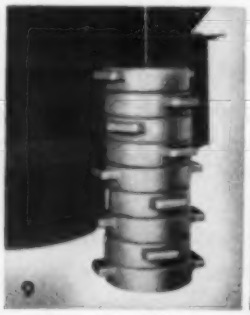
5 **Rotary Plug Valve**
controls flow of finest materials. Plug works freely in self-aligning bearings.



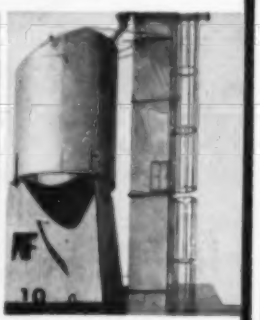
6 **Fill Valves**
single-clam, radial-type, have choker weights on closing edge for jam-proof closing.

7 **Receiving Hoppers**
all sizes, types for box-car, hopper-bottom car, truck, or bag delivery. Weather-tight.

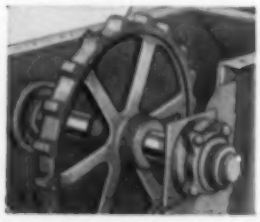
8 **Elevator Buckets**
all-welded, light, smooth. Two types, 7 sizes. Steel chain has carburized knuckles.



9 **Batcher Test Weights**
are available in sets of nine, 50-lb. calibrated units, and two 25-lb. steel hangers.



10 **Elevator Safety Cage**
28-in.-diameter ladder safety cage, welded to casing, costs only a few dollars per foot.



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certain in Puerto Rico," he said, "there would seem to be opportunity for expanded use of fertilizer-pesticide mixtures in Hawaii."

Technical Committees

REPORTS by chairmen of the NFA and APFC technical committees were given at a general business session at which Proctor Gull, Spencer Chemical Co., presided. Dr. V. Sauchelli, Davison Chemical Co., speaking for the committee on chemical control indicated that much still needs to be done on sampling and sampling methods. He indicated too that the committee is working on a compilation of state fertilizer control laws, listing regulations, etc.

In view of the consolidation of the two associations, Dr. Sauchelli reported that a working committee of the NPFI, for the purpose of organizing a permanent technical committee suggested the following to the new Board of Directors: That a new committee be formed to be known as the "Research and Education Committee of the National Plant Food Institute," which would consider 3 main phases of study: (1) agronomy and horticulture; (2) fertilizer technology; and (3) economics and management.

J. Garman, APFC, reported on the various films and TV shorts prepared most recently by the APFC for farmer education and for use by public organizations. The films already completed are on (1) soil testing, (2) state experiment stations, (3) land use, (4) pastures, and (5) a public relations job for the farmer.

A. Bowers, Swift & Co., presented the report for the committee on forage & pasture crops; M. V. Bailey, American Cyanamid Co., reported for the committee on chemical weed and insect control, and R. Bennett, Farm Fertilizers, Inc., outlined the plans and activities of the committee on manufacturing and technology.

Peterson Addresses NPFI

ASSISTANT Secretary of Agriculture E. L. Peterson advised members of NPFI that the price support policy of the Department of

Agriculture is emerging as a dynamic, positive operation in the development of a sound agricultural economy." He said too that "price supports are a market facilitating mechanism," and that "they should not be perverted to other purposes."

Defining conservation as "the wise and intelligent use of our resources . . . while at the same time preserving and enhancing the capacity of these resources," the assistant secretary said the "problem is to couple resource management with production economics and be competitive with the rest of the economy at the same time."

He urged the Council to help provide an ever-constant flow of information to farmers in all areas which affect agriculture. The real production improvements, he said, "come from the solid foundation of research knowledge *applied on farms*. Here is opportunity in which you share, and to which you contribute."

Another feature of the 3-day meeting was a panel including representatives of the nation's 4-H clubs and National Junior Vegetable Growers Association. Institute members were informed of the activities of America's youth in adopting new soil and fertilization practices, farming methods, etc.

William B. Ward, president American Association of Agricultural College Editors, and head of the Department of Extension Teaching and Information, Cornell University, was moderator of the panel. Participating in the discussion were: W. Gunter, national president of the Future Farmers of America; J. Strickland and T. Dotson, National Junior Vegetable Growers Association; and L. Ratlif, 4-H Club member of Mississippi.

Cooley, McClellan Address NPFI

AT the final convention session, Wednesday morning, the program was opened with presentation of the 1954 Soil Builders' Awards, the presentations being made by Louis Wilson, newly named secretary and director of information of N.P.F.I. Recipients were Tom Leadley, editor of the *Nebraska Farmer*, and Kirk Fox, editor of *Successful Farming*, with Mr. Fox's award being accepted for him in his absence by V. C. Weidner of the *Successful Farming* staff.

Hon. Harold D. Cooley, representative from North Carolina in the U. S. House of Representatives for over twenty years and currently chairman of the House Committee on Agriculture, was one of two guest speakers at this final session, taking as his topic "The Truth About Agriculture." Rep. Cooley defended the farm program of his party over the past twenty years, based on fixed price supports for major agricultural crops. He noted that farmers are again in trouble, and that without price supports many farmers would once more be facing bankruptcy. He argued that many such support programs pay their own way, and in some cases even show a profit. He cited further in defense of the farm program that over the years it has raised the farmer's per capita income and sustained his purchasing power, and that the cost of the program has been very small as compared with the billions of dollars of agricultural income during the past twenty years.

Final speaker was Hon. John L. McClellan of Arkansas, chairman of the Senate Committee on Government Operations, dealing with the topic, "Government Competition with Private Business." We must be as concerned over the growth of big government as we are over the growth of big business, he counseled. Government must be restrained and supervised, to bring about efficiency and economy in operation, and to eliminate waste and extravagance. In the light of the recent controversy in the fertilizer trade on competition by TVA with private industry in the manufacture of diammonium phosphate, his remarks were particularly to the point when he reminded that the more government expands in competing with private industry, the more our sources of tax money tend to be dried up.

Sen. McClellan called the attention of his listeners to two new bills

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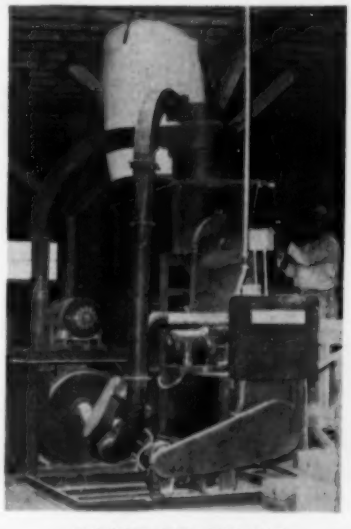
System Includes — Dust hood at loading station; Sifter; Pre-Mixer at floor level; Pneumatic Conveyor-Blender; After-Mixer with dust collector; Dust hood at packaging station, etc; All motors wired to panel box with push button controls.



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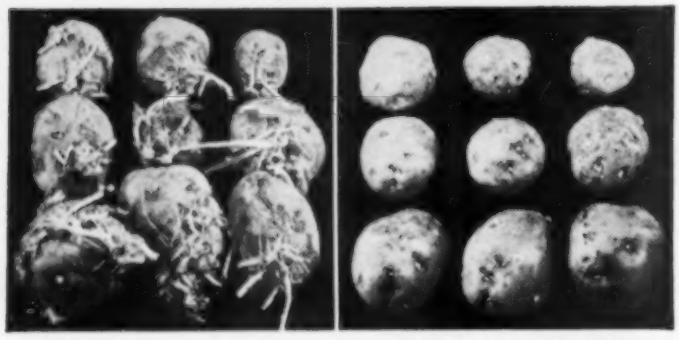

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WHOLESALERS AND CHIPPERS WANT potatoes that will not lose value in storage. When treated with MH-40, potatoes for chipping stay whiter and firmer longer, and lighter chips result. All buyers can safely carry larger inventories.

RETAILERS WANT potatoes and onions that will keep their sales appeal and value on the shelf. MH-40 is the answer.

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GROWERS WANT a crop they don't have to rush to market for fear it will lose its value. MH-40 pre-harvest spray gives this profit protection. It is inexpensive and easy to apply. The time to use it (for potatoes) 14 to 21 days after full bloom. (For onions) one to two weeks before harvest. If your crop is nearing this stage—get MH-40 now! It will produce a crop that will meet the highest standards of buyers, retailers and housewives—and assure you of getting top price at market.

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which he has recently introduced in the Senate, on which hearings will be held shortly. One is a bill which would set up an agency to represent taxpayers at appropriation hearings, which are quite commonly attended principally by representatives of the agencies asking that funds be appropriated. The second bill is designed to limit competition with business. Sen. McClellan solicited assistance for both measures.★★

EDITORIAL

(*From Page* 31)

agency takes business away from commercial industry whose operations pay the taxes which in turn support TVA. It certainly doesn't make sense.

The threat seems to have been met for the moment, but the case serves as a reminder to fertilizer manufacturers, and to industry in general, that they must be constantly alert to the danger of government agencies competing with them in the market-place. Fortunately, our present administration seems more sympathetic to the problems of the businessman in such cases, less inclined to see big government grow bigger. The future trend may well be toward further contraction in the practice of the government competing with the taxpayers who support it.★★

TVA FERTILIZER ROLE

(*From Page* 57)

versy. In Mr. Bennett's testimony before the House Appropriations Committee, he observed that "there are no locations in the United States where a private manufacturer can buy the two ingredients of diammonium phosphate, which are phosphoric acid and anhydrous ammonia, without paying freight on one or the other of the materials."

Dr. Curtis concluded his address with some comments indicating the TVA attitude on suggestions made by the Hoover Commission. The Hoover Commission proposals, if accepted by Congress, he believes, "would abolish the TVA fertilizer

program as it has been carried out during the past twenty years", adding the suggestion "perhaps that it what is intended." This in his opinion would be a serious mistake. The TVA, he believes, "has contributed to the welfare of agriculture and benefited rather than harmed the fertilizer industry in its activities." An industry that has increased its total sales of fertilizer since 1934 from about seven million tons per year to a current figure of twenty-three million tons per year, he argues, apparently hasn't been harmed appreciably by TVA's activities.★★

WASHINGTON REPORT

(*from Page 59*)

of the law. FDA at the same time is restricting exemptions from the law as much as possible so that there will be protection of the public health.

The effective date of the Miller Amendment is July 22. However, Secretary Hobby has the authority to extend the date on a product by product basis for not more than 12 months. She has just taken action to do so in certain instances. In the language of the new order—"Some of these pesticides have been recommended by certain state officials for use on crops throughout the 1955 growing season. Agriculturists, pesticide manufacturers and distributors, and food-law enforcement officials need to know the status of these pesticides under the amendment prior to July 22, 1955, so that they will know whether the pesticides should be employed throughout the 1955 growing season."

Secretary Hobby continues that the Department of Health, Education, and Welfare is prepared to consider requests for an extension of the effective date of the law.

The following criteria, among others, will be used in evaluation and acting upon such requests:

1. No extension where a tolerance has already been established.
2. Extension only where public health will not be jeopardized.
3. That evidence is available on the amounts of residues which remain and that facts are available about its chronic toxicity.
4. Extension should not be granted for a chemical which causes alarming symptoms in test animals.
5. Extension should be granted only when the chemical is registered with USDA.
6. Extension should be granted only to the end of the 1955 growing season. In this the Food & Drug Administration states that the principal growing season in the United States ends by October 31.

* * *

If you have one foot on the ground and the other in the air, you'll be especially interested in the special report on agricultural aviation just issued by USDA. Along with the technical information are forecasts of the future—what the future agricultural aircraft will look like—what it'll cost—whether planes be fixed wing or helicopter—speed with which farmers will go into aerial spraying and application of fertilizers.

From a business point of view—from a scientific point of view—or just for your own information—you'll enjoy paging through it. You can get your copy by writing to:

Office of the Administrator, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C., Attn: J. R. Allgyer.

* * *

The residue tolerance spotlight is being shifted to meat and may be held there for some time to come. Serious discussion is taking place on residue tolerance for red meat which may involve a broad segment of the food industry as well as agricultural chemicals companies.

It's been rather well established that some chlorinated hydrocarbons are stored in animal fat. Question is how much fat on the average do we eat? Also, how much of the chlorinated hydrocarbons are stored in animal fat which could be transferred to human tissue upon consumption? The important question is what, if

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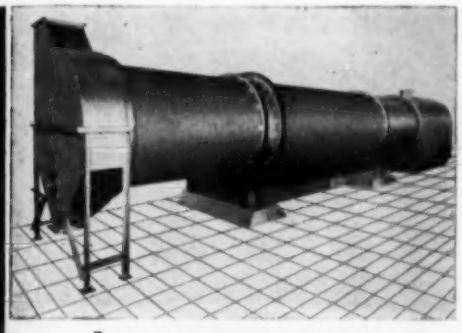

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any, hazard to human health does this present?

The problem is extremely complex and varies from an accurate interpretation of general agricultural practice to a simple definition for—what is meat?

After having sat through days and weeks of the residue tolerance hearings on fruits and vegetables, this reporter wonders how much time will be consumed ultimately in resolving the residue problem. It is hoped that it will be handled with wisdom and discretion.

* * *

Secretary Hobby, whose handling of the polio vaccine affair drew considerable fire, is catching more heat in the battle over sanitary standards for flour and grain. The polio case is front page news, whereas the flour story is back page copy. Nonetheless, there is a deep division of opinion among government officials and some members of the trade over sanitary standards for grain and flour.

Apparently there are no tolerances for the use of pesticides to protect stored grain. It would seem that while the Hobby case has political implications, the fundamental question is whether the public should be offered a product containing a safe level of pesticide residue or of such a sanitary level that there are grounds for objections. It seems to be a matter of eating the bugs or the residue—only in this case there's no choice. You eat the bugs.★★

IRON CHELATES

(*from Page* 35)

other trace elements. The important point in growing plants for optimum production is to maintain all the essential trace elements in proper ratios to each other. This is much simpler said than done.

Use of chelated iron for iron-deficient chlorotic plants results in an adjustment of the iron ratio to that of manganese and, no doubt, to the other essential nutrient elements as well. But such treatments could readily be overdone. The quantities required are small—of the order of 1 tablespoonful of the iron chelate to the soil under an azalea bush or ½ pound under the spread of the branches of a citrus tree. Acre rates are of the order of 25 to 50 pounds. If the powdered forms come in direct contact with leaves or fruit, they may do damage. The material can be applied in spray form, but in very dilute concentration of about 1 pound dissolved in 100 gallons of water and applied at the rate of 400 gallons an acre.

Chelated forms of all the other trace elements can be produced with EDTA or closely related compounds. When applied to the soil, however, they tend to react with the iron in the soil to form an iron chelate. This tendency is so marked that EDTA alone, with no iron contained in it, may meet the requirements in overcoming iron deficiency under some conditions. The research problem now before the commercial chelate chemist is that of producing a series of stable chelates, one for each of the trace elements. This will involve consideration also of the nature of the soil to which the material is to be applied, with special reference to its pH value.

Another peculiar fact about EDTA is that it is not decomposed by soil microorganisms or metabolized by plants. It exists as such in the soil, is absorbed as such by plant roots, and continues to exist in the plant in its original form, or at least largely so. That is quite different from what happens to citric acid. This material is rapidly decomposed in the soil and thus loses its value. But it is important to keep in mind that decomposing soil organic matter may release compounds that have at least temporary complexing values and possibly other compounds that have more or less permanent chelating values. This may account, in part, for the especially good effects of soil organic matter.

A great deal of research work is now under way on chelates in relation

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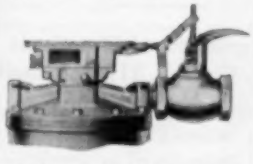

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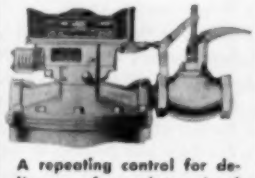

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Insect Control by Chemicals

by A. W. A. Brown

817 pages, $12.50—This text classifies the insecticides and gives their chemical, physical properties; discusses the hazards to avoid in formulation, mixing and use of compounds; and illustrates modern application equipment.

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to plant nutrition, both as to the fundamental aspects of the problem and the possibilities in practice. There is some evidence that they may have supplemental hormonal effects. Concentrated efforts are being directed to the study of the behavior of chelating agents, both in soils and plants, at the three research institutes from which the illustrations used in this article have been obtained. Interest in the subject is such that rapid development can be anticipated.

There is some evidence that these chelating compounds may have value in maintaining fertilizer phosphorus in a more highly available state in the soil. For this purpose they must be chosen in relation to whether the soil is acid or alkaline. Rates of use for such purposes are of the order of 2 pounds per ton of fertilizer.★★

F-P MIXTURES

(*From Page* 47)

In several instances, control officials who had not yet faced the F-P situation, answered the questionnaire by stating the way in which it probably *would* be handled.

It is interesting to note that, with experiment stations not very enthusiastic about the mixes, only 14 states limit registration and distribution of fertilizer-pesticide mixes to those mixtures recommended by the station. Numerous other problems of interest to the control officials in carrying out their jobs, and to the industry as well, are considered in Dr. Berry's survey. One of the most important is the question of regulations concerned specifically with handling the mixes. Only 11 states have established such regulations, although an additional 10 are considering changes in their laws.

Some fetrilizer manufacturers who are not bullish about the products, have complained in the past that the fertilizer industry is saddled with most of the work in preparing the mix, because the bulk of the mix, of course, is plant food.

Therefore some leaders have urged the materials be mixed on the dealer level. While the survey did not go into this question, it did show that more than half the states permit bulk sale and that a big majority permit "Buyers Mixtures" whereby a farmer may request any pesticide be added to his fertilizer by the manufacturer. *A tabulation of the survey is given on page 46 to show response to the various questions.*★★

AEROSOL MARKET

(*From Page* 33)

flies, horn flies, mosquitoes and similar insects that bother livestock as much as they do humans can be controlled effectively with special areosol sprays that depend on ingredients like methoxychlor, allethrin and pyrethrin for their insect killing effectiveness.

More specialized areosol products are designed to kill screw worms, fleece worms, blow flies, grubs, and spinose ear-ticks that infect cattle, horses, goats, sheep and other domestic animals. The cattle screw worm sprays, for example, provide protection from five to seven days and can be applied safely over wounds caused by dehorning, dog bites, wire cuts, docking, shear cuts, and castration. Grub sprays are applied to the cysts on the backs of infested animals 30 to 45 days after the appearance of the first grubs, with repeat sprays every 30 to 40 days for the remainder of the grub season. The ear-tick sprays not only kill the larvae and nymphs, but protect the animal for three weeks or more against reinfestation.

Agricultural chemical producers are constantly working to adapt other preparations to the time-saving, convenient, clean-to-use aerosol package, and the future of such products seems promising for both the consumer and themselves. Though none will estimate current sales volume for the agricultural aerosols, all agree it's a healthy growth, keyed to the small consumer's eternal search for easier and better ways of getting the job done.

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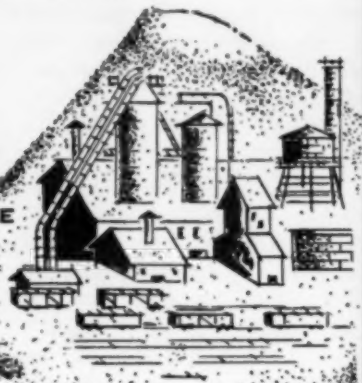

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and green house use. Such products, however, are usually more toxic than the household and garden sprays, and are for specialized use by trained personnel only. In the hands of qualified operators they have proved a great boon to the commercial flower grower by enabling him to achieve efficient control, with a minimum of fuss and bother, of a multitude of pests on crops grown under glass. They are always used with a gas mask and full protective clothing. At the end of the application the operator should remove his clothing and bathe thoroughly with warm water and soap.★★

CODLING MOTH

(*From Page* 42)

OS-2046 (2-carbomethoxy-l-methylvinyl dimethyl phosphate), were highly effective in reducing entries but stings were numerous. Overall control was not as effective as where DDT or parathion were used.

Botanical Insecticides

RYANIA was first tested for codling moth control about 1943. Control at that time did not appear as promising as that obtained with DDT, although control was better than that secured with lead arsenate. Possibilities of development of resistance to DDT by the codling moth and the reduction of natural enemies of orchard mites and insects where DDT was used has renewed interest in this material during recent years. Clancy (1955) has reported outstanding codling moth control and reduction in mite populations where ryania was used in tests in West Virginia. Reports by other workers have indicated codling moth reduction, especially in entries, but generally excessive stings. At Vincennes in 1954, field plots receiving 7 cover sprays during the season had 2.4 worms per 100 apples and 42.1 stings where Ryanexcel 96-3 (containing 96 per cent of ryania with 3 per cent of propyl isome) was applied, using 6 pounds to 100 gallons, compared to 14.1 worms per 100 apples and 26.4 stings where DDT was used at 1 pound (actual) to 100 gallons. Reducing the Ryanexcel to 4 pounds and including 2 pounds fixed nicotine with 2 quarts summer oil increased control. Worms per 100 apples averaged 1.6 and stings 9.9. Control where Ryanexcel was used was not as effective as where Diazinon was used. Ryania is considered relatively non-toxic to humans.★★

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WASHINGTON STATE

(*from Page* 45)

recover with development of club-like adventitious roots—particularly those plants less severely injured at first. Even though their maturity was delayed, these plots yielded only 40 per cent fewer beans than the untreated checks.

Both 2 and 6 pounds at bloom stage caused some leaf chlorosis and damage to root systems. Two pounds didn't cut yields significantly. Six pounds cut them 29 per cent. Lab and greenhouse tests showed no carryover effects of 2,4-D in bean seeds harvested from treated plots.

Dinitro amine has done well in controlling weeds in a number of different crops. Used 2 or 3 days before sweet corn emergence, it has given WSC experimenters control of many annual weeds with little or no corn injury. Put on as a spray on a smooth, moist seedbed, it will control weeds for from 4 to 6 weeks.

For control of annual weeds in peas not seeded down with a companion crop, dinitro amine can be put on 2 to 4 days before peas emerge. For annual weeds in peas seeded

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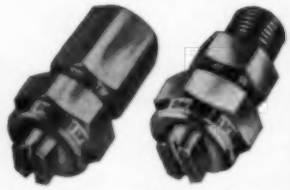

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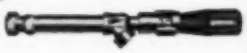

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down with a grass-clover companion crop, the researchers say to spray when the grass seedlings are 1½ to 3 incres high and the clover has at least one true leaf. For Canada thistle and most other broadleaved perennial plants growing in peas, dinitro amine should be sprayed on when the thistle regrowth is 4 to 8 inches high, according to test results. Dinitro amine also is good for weed control in strawberries, say the investigators.

On bulb crops—an important western Washington industry—CMU is recommended for post-emergence control of weeds in tulips, iris and daffodils. One thing the research men have found is important is spraying this material—you must provide for continuous, positive mechanical agitation of the mixture when applying it to bulb fields

Plant Disease Control

A FOURTH area in which chemicals are an important tool in solving agricultural problems is that of disease control. Once more, research in the Columbia Basin offers a good example. There, soil-borne diseases are a problem. Potato scab is a particular problem on the "new" soils just being cleared and cultivated for the first time. A USDA pathologist working with the college in that area has found that 50 pounds of pentachloronitrobenzene per acre will control the scab. Back east, scientists have had to use 150 pounds to get control. But in Washington, that amount affected adversely the size of the potatoes.

Wheat — the number one agricultural crop of Washington — is susceptible to smut troubles. Plant breeders try to keep ahead by finding new resistance and breeding it into acceptable wheat varieties. At the same time, plant pathologists are working to break the smut if possible. The state college at Pullman is the site of a USDA regional smut laboratory. Scientists of this laboratory work throughout the Pacific Northwest studying the smut situation, seeking a cure. They've found Anticarie and pentachloronitrobenzene seed treatments both to give good control of soil-borne common bunt of winter wheat in a test run recently. Anticarie also is effective against the soil-inhabiting dwarf bunt of wheat in the Pacific Northwest when applied to the soil simultaneously with the seeding operation. Combination wireworm-bunt control materials were effective in controlling bunt in a seed treatment, but those containing lindane were injurious to the seed.

Snow mold is another problem of wheat — and of turf, too — that USDA and state college researchers have been studying. One scientist in particular has shown that for snow mold in wheat Ceresan M or Ceresan M 2x seed disinfectant is definitely effective. The phenyl mercury formulations are apparently cheaper and easier to apply than earlier recommended materials.

Karathane has been giving consistent control of apple powdery mildew. And it has proved effective on pears also. Incidentally, a state college plant pathologist has found powdery mildew on an almond tree — apparently the first report of almond mildew from the United States. He was able to find only two other reports of this occurrence — one from Malta and one from India.

Chemicals also are useful in fighting bulb diseases. Crown rot and black rot have been pairing up to plague Washington's bulb growers. Black rot likes it cool, and so does its main damage in early spring. As it warms up, its action slows down. Crown rot is just the opposite. So where black rot leaves off, it takes up. Together they're a real headache for growers — and scientists.

Pentachloronitrobenzene looks promising against both rots in tests run by USDA and state college scientists. However, at the rate they know it looks good, the material is too expensive. So they're now in the process of checking lower rates and also furrow treatment rather than overall field treatment. The hope is to lower the cost to where use will be commercially feasible. In the mean-

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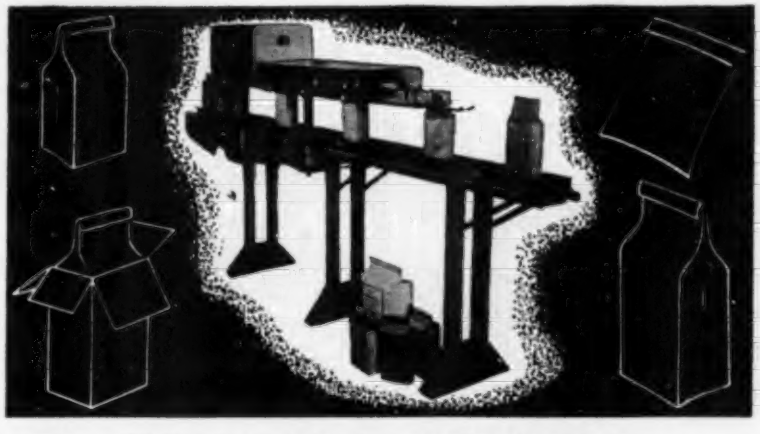

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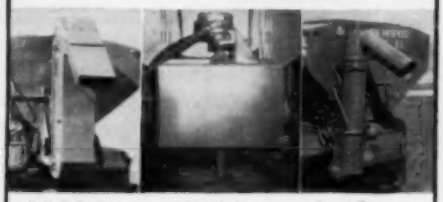

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time, they're checking new materials as they come out to see if there's something better than the PCNB.

THAT'S a picture of some of the experimental work with agricultural chemicals that is going on in the Washington Agricultural Experiment Stations — a small part. A sample of some of the other studies under way are those on the effects of herbicides on the nitrogen metabolism of plants, studies on the differential susceptibilities of sucking insects to demeton, and work on the nature of the process of enzyme inhibition by organic phosphates.

And what we've presented here is only a tiny part of the over-all picture of the stations' research program.

Some idea of the scope of research done is shown by the fact that stations scientists have begun over 1200 research projects since the stations were established in 1891. Of these, over 800 have been completed and somewhere near 400 are in various stages.

These projects deal with most of the major problems of Washington's agriculture. On the animal side, they cover such things as dairy cattle nutrition, artificial breeding, cattle diseases, development of a bacon-type hog, use of by-product feeds, urinary calculi in sheep, and beef cattle improvement.

In poultry, Washington's agricultural research men have a new chicken and a new turkey — both white — which hold promise of improving the poultry industry's position when they are released in a couple of years or so. There's work with antibiotics and other growth factors for poultry, work in the nutrient elements necessary for the most satisfactory poultry growth. On the products side, experiments in scalding, roughing, and cold-storage of birds are under way. Poultry scientists also are studying bloodspots in eggs, considering questions such as the environment of the birds, genetics, and nutrition.

Veterinarians have discovered a bacterin to fight erysipelas in turkeys and studied methods for overcoming such poultry diseases as respiratory diseases, avian monocytosis, coccidiosis, and others. Livestock diseases such as mastitis, leptospirosis, and various parasitic diseases are under investigation.

Engineers are working on the irrigation problems of the booming Columbia Basin, and on machinery to meet the needs of the many crops and processing industries of the state. Rural sociologists are studying the effects of modern agriculture on the rural family and its life.

Plant breeders are constantly trying to develop new and better varieties and crops for Washington. They're using x-radiation to produce plant mutations, hoping to cause new characteristics they need and desire.

Soils men are studying drainage problems in the irrigated areas of the state, learning how best to apply fertilizers, and at the same time mapping the state in soil surveys as rapidly as possible.

Plant pathologists are working overtime to find out needed basic information about new plant diseases (before control measures can be formulated) and to keep abreast of new developments concerning old diseases.

Home economists and horticulturists are keeping abreast of the tremendous new giant—the frozen foods industry — in their experiments on how best to freeze and keep the various fruits, vegetables, and juices. Home economists also are doing consumer food purchase and use studies, and consumer preference studies in processing, packaging, and preserving food. Dental caries and human nutrition experiments also are under way.

All in all, Washington's agricultural research is a tremendously dynamic thing. It is serving one of our last "frontier" areas. The state is booming, growing, and developing right now. And the research program at least partially has to be geared to the same urgency and immediacy. However, like the state, Washington's agricultural research program has a bright future that is being planned for now. Chemicals, as another tool of science and agriculture, have a definite place in that future.★★

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PACIFIC ESA MEET

(*From Page 70*)

The Federal-State Regulatory Program was outlined by L. J. Padget, who is in charge of the Khapra Beetle Control, Plant Pest Control Branch, ARS, USDA, Oakland, Calif. He stated that the Khapra beetle was first found in 1953, and at that time they had no idea how widespread the pest was. Through intensive survey it was found in Arizona, California and New Mexico. No other infestations outside of these states have been located to date. Because of the wide variation in state quarantines and embargoes on infested areas, a federal quarantine was set up to make it easier for warehouses in infested areas to know what to do. The Khapra beetle is a pest of warehouses and is spread mainly in articles of commerce, as the larvae crawl on and into most anything, so that quarantine regulations had to be set up against any material which in any way might be associated with the pest. At the present time there are two types of treatments permitted. 1) heat — commodity is heated to a temperature high enough to kill all insect life. (This is used in milling material where heat is used in the milling operation.) 2) fumigation with methyl bromide at the approved rate.

The only way a commodity can be moved from infested premises is on the basis of fumigation treatment. Currently their greatest concern is protection of commodities from recontamination after treatment.

"The 64 billion dollar question is whether Khapra beetle can be eradicated from the United States" H. M. Armitage, Chief, California Dept. of Agriculture told the group. "Two important biological considerations favor this approach, as the Khapra beetle does not attack growing plants, and is not found under open field conditions. While the adult beetle has well developed wings, these apparently are not used. Thus we have infestation restricted to individual premises. After a most intensive survey in three states, only about 4% of the thousands of premises inspected to date have been found to be infested. Early tests showed both contact and space sprays of little value in eradication, no matter how effective the chemical might be, as it is impossible to reach all of the larvae in the incredibly small building crevices in which they are able to hide. Their ability to hide out under such conditions for periods of at least three years without food, plus their extremely high reproductive capacity, greatly minimizes any residual value such chemicals might have.

"Use of a highly volatile, penetrating fumigant has seemed to offer the best means of eradication. And because larvae are found on the outside, as well as inside, of infested buildings, the rather unusual method of covering the entire infested structure with a gastight covering was necessary, so that it could be fumigated in its entirety."

Methyl bromide was selected as the fumigant because it is biologically effective against all stages of the beetle and is non explosive, non-inflamable and least hazardous to warm-blooded animals of any fumigants studied. However, experienced grain fumigation personnel have found the dispersal of bromide through any grain mass to be very poor except in the presence of forced mechanical recirculation. For this reason the exceptionally high dosage of five pounds per thousand cubic feet was established for the unusually long period of exposure of 48 hours.

As a result of large-scale fumigation tests, federal authorities now recognize the maintenance of a minimum concentration of two pounds of methyl bromide at the lowest point sampled during any twenty-four hours of a 48 hour exposure period, as resulting in eradication where Khapra beetle is concerned. Such concentrations must be supported by actual readings of gas samples taken at selected critical locations at regular intervals through the full exposure period. In addition to fumigation, the surface area adjacent to the building under treatment, extending out at least 100 feet or to a natural barrier, such as a road, irrigation ditch or other similar obstruction, is being thoroughly and repeatedly sprayed with malathion and diesel oil, using five pounds actual in 100 gallons.

Covering of structures for fumigation is proving the most difficult and expensive phase of the operation. Some of the mill-storage structures have presented a maze of buildings, tanks, catwalks, and towers comprising up to four million cubic feet. Costs for covering have reached a maximum of $18 per thousand cu. ft., in one instance $47,500 to cover a single premise.

In spite of all the difficulties encountered, definite progress toward eradication is being made. Over one third of all known infestations have already been treated and officially released from infested status.

Yellow Clover Aphid

THIS pest is another one which was not accurately identified until considerable economic damage had been done. The yellow clover aphid is unique on alfalfa. It is of a type usually found on trees.

Dr. D. M. Tuttle, University of Arizona, Tucson declared this insect is the major alfalfa pest in his state. While the aphis is not difficult to control, this program is complicated by the fact re-infestation is very likely to occur within 10 days after treatment, and in some cases within a few days. On young alfalfa, the aphis can take out a complete stand when it is in the 2,4 or 6-leaved stage. Dr. H. T. Reynolds, University of California, Citrus Experiment Station, Riverside, described the heavy honey-dew secretion of the aphis, and how equipment used in infested fields must be washed and steam-cleaned before it may be re-used. Black mould forms on alfalfa foliage, and regrowth is usually weaker. Where fields are still infested, they may not come back at all. Systox is compatible with bee keepers, Reynolds said, and is promising in field tests and not too rough on most predators, but indirectly does get a few ladybird beetles when they feed on poisoned aphids.

Martin M. Barnes, Citrus Experiment Station, Riverside, served as program chairman; Otto P. Steinen, Naugatuck Chemical Division, U. S. Rubber Corp., Los Angeles, was arrangements chairman. Registration chairman J. C. Ortega, Citrus Experiment Station was assisted by B. R. Bartlett, also of the station, R. H. Daehnert, General Chemical, Los Angeles, and H. F. Pierce, Hercules Powder Co., Los Angeles. Operations chairman E. L. Atkins, Jr., was assisted by L. R. Brown, M. H. Frost and I. M. Hall of Los Angeles.

WACA MEETING

(*From Page 72*)

Chemicals Association, to exchange notices on legislative matters pertaining to the industry.

The question of how best the bulk handling and labeling of agricultural chemicals and fertilizers may be controlled is also under consideration, he reported, particularly since some state laws do not define the size of a "bulk" shipment, including in this term units of 5 pounds, 10, 50 pounds and up.

The spring meeting was arranged by Secretary Barnard and a committee of Elmer J. Davis, Los Angeles Chem. Co., Los Angeles; C. H. York, Shell Chemical Corp., Los Angeles, and R. Hillebert, L. H. Butcher Co.

Mr. Barnard advised the group the following companies had become members of WACA since January 1, 1955, representing a 44% increase in membership:

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. . . . How do the publications in the agricultural chemical field stack up on these important points of "paid" and "free, . . . "audited" and "unaudited"? The story may be summarized briefly as follows:

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Tale Ends

The "Wonsover" (described in May, 1955 Ag. Chem., p. 130) was demonstrated to farm and press representatives on June 23rd. The 10-ton unit in a single operation is reported to till the soil to any depth up to 10 inches. It also mixes and applies weed killer, insecticide and fungicide, limes and fertilizes the soil, plants the seed and packs the soil. A product of Norton Portland Corp., Portland, Me., the unit is scheduled for immediate production and will cost under $20,000. To do a complete job it should also be equipped with an attachment to plow under six farm hands and the farmer's banker.

AC

Improved printing, with color, is just one of the ways firms in the ag chem field are dressing up their messages to the public. Last month awards went to NFA and Spencer Chemical Co., in a national contest for specimens of offset printing. NFA won first prize in the wall chart division for its colorful and instructive sheet "How To Take a Soil Sample," while Spencer was awarded a third prize in the business reports category for its 1954 annual report.

AC

Among those missed at the recent NPFI gathering at White Sulphur was Bob Zipse, general manager, Insecticides Division, Olin-Mathieson Corp. Bob is convalescing at his home at Plandome, L. I., N. Y. following a coronary attack several weeks ago. He is reported progressing nicely, and is expected to be back on at least part-time duty shortly.

AC

For the first time in years the fertilizer conventioneers hit bad weather at White Sulphur, unusual indeed for June at this famous resort. But even the cold, intermittent rain failed to chill the enthusiasm of the golfers, either barnyard or fairway variety. And the "anyone for tennis" band, all in skimpy white pants, froze through two straight afternoons of play.

AC

New convention accommodations at the Greenbrier include handsome and well-appointed meeting rooms which are now adequate to handle such sessions as the NPFI gathering. But admittedly the sleeping room capacity was strained to the seams by the overflow attendance.

AC

As our annual suggestion to the management we trot out our favorite theme as to the desirability of installing a big, modern, outdoor swimming pool down near the Casino. Complete with bathing beauties. And they could discontinue the newly reopened wallet-lifting operation that we see has taken over again where Kate's Mountain House left off.

AC

Mr. Postman, What Next?

MAGAZINES, magazines, magazines! And when would I find time to read 'em all?

Some I want. Some I read. Some these publishers guys just send me, free for nothing. Even them I read sometimes.

But "Ag Chemicals" I always find time for. Cause why? Cause it tells me what I need to know. And I pays for it. And after I pays for it, you can be sure I'm goin to read it.

AGRICULTURAL CHEMICALS

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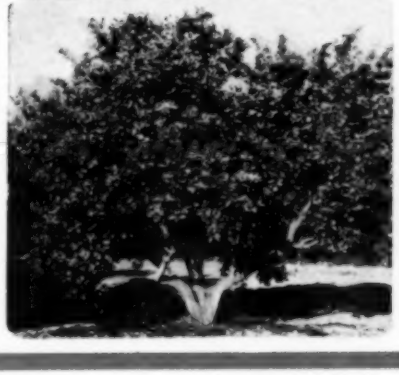
OLD soils need NEW life!

revitalize them with—THE IRON CHELATE

PERMA GREEN IRON 135

for BIGGER, BETTER and FASTER-GROWING CROPS



UNTREATED

ORANGES

Four ounces to one pound PERMA GREEN IRON 135 per tree produces dark green leaves and more, larger and better colored oranges.

TREATED

When iron is lacking and plant leaves turn yellow, PERMA GREEN IRON 135 makes them dark green in two weeks' time.

PERMA GREEN IRON 135 is an organic chelate that moves upward with the sap to rejuvenate the entire plant.

PERMA GREEN IRON 135 *now produces—*

— more and juicier oranges and grapefruit
— more and larger nuts
— more nutritious vegetables
— larger and more beautiful roses
— deeper-green leaves on azaleas and rhododendrons
— more attractive ornamental trees and shrubs.

Write for detailed information on PERMA GREEN IRON 135 for plants and reprint of scientific article on CHELATES.

Developed by RESEARCH • Proved by PERFORMANCE

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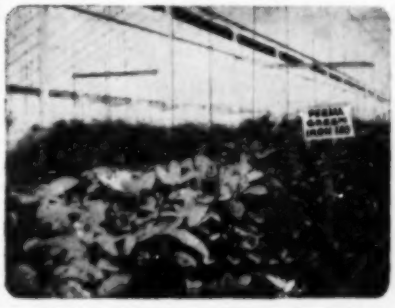
SUNFLOWERS

Grown in nutrient solution. Small yellow plant at left treated with iron sulphate.

Large dark green plant at right treated with PERMA GREEN IRON 135.



GARDENIAS (Greenhouse)

Iron is very important for gardenias. Treat each bush with 1/16 to 1/8 level tablespoonful PERMA GREEN IRON 135 to insure dark green leaves and large pure white flowers.

TROUBLE AHEAD?

These growers are justly proud of their crop which has germinated and passed its first big test in the struggle for survival. But trouble is just around the corner. In the soil, or at the base of the plants, are early-season insect pests, ready to feed at the farmer's expense. As the plants mature, other insects will invade the field. To make a profit, this crop needs protection.

Farmers all over the world, growing a diverse number of food, feed, and fiber crops, rely on toxaphene for effective, long-lasting insect pest control. Toxaphene insecticides are now officially recommended for use against more than 200 species of destructive insects around the globe. On many crops, toxaphene is the standard insecticide for all-season control.

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